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ACTIVITIES OF THE INTERNATIONAL ATOMIC ENERGY AGENCY RELEVANT TO ARTICLE III OF THE TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS

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Conference of the Parties to the NPT

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ARTICLE III OF THE NPT

1. Each non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency's safeguards system, for the exclusive purpose of verification of the fulfilment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices. Procedures for the safeguards required by this Article shall be followed with respect to source or special fissionable material whether it is being produced, processed or used in any principal nuclear facility or is outside any such facility. The safeguards required by this Article shall be applied on all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere.

2. Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this Article.

3. The safeguards required by this Article shall be implemented in a manner designed to comply with Article IV of this Treaty, and to avoid hampering the economic or technological development of the Parties or international co-operation in the field of peaceful nuclear activities, including the international exchange of nuclear material and equipment for the processing, use or production of nuclear material for peaceful purposes in accordance with the provisions of this Article and the principle of safeguarding set forth in the Preamble of the Treaty.

4. Non-nuclear-weapon States Party to the Treaty shall conclude agreements with the International Atomic Energy Agency to meet the requirements of this Article either individually or together with other States in accordance with the Statute of the International Atomic Energy Agency. Negotiation of such agreements shall commence within 180 days from the original entry into force of this Treaty. For States depositing their instruments of ratification or accession after the 180-day period, negotiation of such agreements shall commence not later than the date of such deposit. Such agreements shall enter into force not later than eighteen months after the date of initiation of negotiations.

Activities of the International Atomic Energy Agency Relevant to Article III of the Treaty on the Non-Proliferation of Nuclear Weapons

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I. Executive Summary

1. States Parties to the NPT rely on Agency safeguards for assurance of the compliance by other States with their non-proliferation undertakings and to demonstrate their own compliance. The provision of such assurance promotes further confidence amongst States and, being a fundamental element of the NPT, IAEA safeguards help to strengthen their collective security. During the past 25 years, the Agency has been able to provide a high level of assurance of the non-diversion of nuclear material which has been placed under safeguards, and to identify cases where safeguards obligations are not being met. Effective safeguards, particularly in respect of weapons-usable material i.e. separated plutonium and highly enriched uranium, have been maintained despite the increasingly severe resource constraints resulting from nine years of zero-real-growth budgets at a time of significant real growth in the work load. Safeguards have been implemented in a way which the Agency considers to be responsive to Article III.3 of the Treaty, to the relevant provisions of INFCIRC/153(Corr.) and to requirements as expressed, inter alia, at previous NPT Conferences.

2. Discoveries in Iraq, following the Gulf War, drastically increased the political expectations of the Agency's safeguards system. Safeguards are now looked to not only for assurance of non-diversion of declared nuclear material and non-misuse of declared nuclear facilities but also for assurance about the absence of undeclared nuclear activities. The Agency's Board of Governors and Secretariat have responded and continue to respond to these changed expectations and a number of new safeguards strengthening measures have been introduced.

3. Currently the Agency is carrying out a major programme for assessing, developing and testing a wide range of further potential measures for strengthening its capabilities to detect undeclared nuclear activities. More generally, it focusses also on seeking to improve the technical and cost-effectiveness of safeguards as called for by previous NPT Conferences. The results should be known by March 1995. Whatever results, in the final analysis the Agency's ability to live up to the expectations placed on its safeguards system will depend on the extent to which States, on whose behalf it works, are prepared to grant it the necessary authority, resources and political support.

4. Safeguards are dynamic not static. They function in a constantly changing environment, the result of both political and technological developments. The inception of Agency safeguards pursuant to the NPT was a watershed in the evolution of the safeguards system. Since that time, effective IAEA verification has proceeded in step not only with ever larger numbers of adherents to the Treaty but also with successive

technological improvements as nuclear facilities and installations have become increasingly complex.

5. There are limits to what safeguards can do. Furthermore, Agency safeguards are only one component - albeit an important one - of a wider set of measures designed to counter nuclear proliferation. They are neither a policing nor an enforcement mechanism and depend, for maximum effectiveness, on full cooperation from States. The greater the degree of cooperation, particularly in demonstrating transparency of nuclear policies and programmes, the greater the degree of assurance that derives and can be given.

6. Safeguards are but a part of the wider concept of nuclear transparency. Under NPT safeguards agreements, States are obliged to declare all their nuclear material and installations to the IAEA and the purpose of safeguards inspection is to create confidence that such material and installations are being used exclusively for peaceful purposes. Nothing, however prevents a State from going even further in transparency than the NPT system requires. Some have done so, for example by offering very full information about their nuclear activities or by extending invitations to the Agency to visit any location at any time. Measures such as these can be of great value in strengthening the confidence in and between States that NPT safeguards verification is designed to provide.

II. Safeguards under the NPT: Purpose, Operation and Review

7. Safeguards applied in accordance with Article III of the NPT are a form of institutionalized nuclear transparency through which the IAEA can verify that a State's nuclear activities are being used exclusively for peaceful purposes. However, IAEA safeguards are only one component of a wider set of measures designed to give assurance against the proliferation of nuclear weapons. Other major components of the regime are the legal instruments in which nuclear non-proliferation commitments are anchored, such as the Nuclear Non-Proliferation Treaty (the "NPT" or the "Treaty"), mechanisms to ensure compliance, such as recourse to the Security Council; nuclear export control systems; and most importantly, policies pursued in support of the regime as disincentives to the acquisition of nuclear weapons, such as regional accommodations and steps towards nuclear disarmament. All of the components are mutually reinforcing.

8. The political objectives of NPT safeguards are to assure the international community that a State Party to the Treaty is complying with its peaceful use undertakings and to deter the

diversion or misuse of nuclear materials and facilities from peaceful use through the risk of early detection. The technical objectives of Agency safeguards under NPT agreements are that the IAEA be able to detect, in a timely manner, a diversion of one significant quantity (SQ)[1] of nuclear material from a State's peaceful nuclear activities and to ensure that all nuclear material subject to safeguards in a State is declared to the Agency.

9. The three basic features of the safeguards system are: Nuclear material accounting through which, primarily on the basis of information provided by the State, the quantities of nuclear material in the State are established and changes to the inventory are recorded; Containment and surveillance measures, to monitor access to or movement of nuclear material or equipment, e.g. the use of cameras and seals which take advantage of physical barriers such as walls; and on-site inspection during which IAEA inspectors carry out such measures as examining records, taking measurements, verifying the functioning and calibration of instruments and applying containment and surveillance for the purpose of verifying States' nuclear accountancy data.

10. On site inspection is the most important element of the safeguards system. IAEA inspections are of three types, ad hoc, routine and special. Ad hoc and routine inspections are the norm, through which the Agency has access to relevant records and to locations where nuclear material is or may be present. Special inspections are carried out unusually, and may be prompted by the State itself, or by the IAEA if it considers that information made available by the State is not adequate for the Agency to fulfil its responsibilities under the agreement.

11. The safeguards system is basically an audit system and, like any other audit system, cannot provide assurances or conclusions about future compliance or intentions. Nor is the safeguards system an enforcement mechanism. Rather, it functions as a source of assurance of compliance, or as an alarm signalling non-compliance or circumstances in which the Agency is precluded from exercising its rights and fulfilling its

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[1]A significant quantity is the approximate quantity of any given type of nuclear material which, taking into account any conversion process involved, is required for the manufacture of a nuclear explosive device. The timely detection of diversion is a reference to the maximum time frame within which the Agency seeks to detect any diversion from peaceful use. For this quantification, the Agency looks at the "conversion times" required to convert different types of nuclear material into a nuclear explosive device.

obligations. This in turn sets in motion other response mechanisms. Evidently the scope of safeguards verification cannot go beyond the legal commitment that is to be verified. Further, the degree of assurance of compliance provided through the system depends in large part on the extent of access to information and locations: in general, the greater the access, the greater the degree of assurance. Under the NPT, all of a State's peaceful nuclear activities are subject to safeguards and assurances can in principle be provided about the totality of a State's nuclear activities. However, the risk of undetected diversion can never be zero even with a finely meshed verification system.

III. Historical Background

12. The IAEA's safeguards system is based upon the provisions of the Statute of the IAEA, which entered into force in 1957. Article III.A.5 of the Statute authorizes the Agency to establish and administer safeguards to ensure that projects carried out or fostered by the Agency are not used to further any military purpose. Article III.A.5 also authorizes the Agency to apply safeguards to any bilateral or multilateral arrangement, at the request of the parties, and to any of the nuclear activities of a State, at that State's request.

13. With the entry into force in 1970 of the NPT, the IAEA was vested with the responsibility of assuring, through its safeguards system, compliance by non-nuclear-weapon States (NNWSs) Parties to the Treaty with their obligations under the Treaty.

14. In 1970, the Board of Governors established a Safeguards Committee to advise it on the contents of safeguards agreements to be concluded between the NNWSs party to the NPT and the IAEA. The Committee developed a document entitled "The Structure and Content of Agreements between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons", which the Board of Governors approved in 1972, requesting the Director General to use the document as a basis for negotiating safeguards agreements under the NPT. The document was published by the IAEA as INFCIRC/153 (Corr.).

15. INFCIRC/153 has also served as a basis for the structure and content of comprehensive safeguards agreements concluded pursuant to the Tlatelolco Treaty[2], and is considered the

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[2]The Treaty for the Prohibition of Nuclear Weapons in Latin America, United Nations Treaty Series, Vol. 634, No. 9068.

standard for safeguards agreements under the Rarotonga Treaty[3]. It also provided a basis for the negotiation of unilateral comprehensive safeguards agreements with non-NPT NNWS and for the Quadripartite Safeguards Agreement concluded at the request of Argentina and Brazil.

16. In addition, while the five nuclear-weapon States (NWSs) all of which are now parties to the NPT are not obliged to conclude a safeguards agreement with the IAEA, each of them has voluntarily accepted the application of Agency safeguards to all or part of its peaceful nuclear activities along the lines of INFCIRC/153 (Corr.).

IV. Key Developments Since 1990

17. At previous NPT Conferences, States Parties have affirmed their determination to strengthen further the barriers against the proliferation of nuclear weapons and other nuclear explosive devices and have urged the Agency to take full advantage of its rights under safeguards agreements. In this context, the Conferences noted with satisfaction that the IAEA, in carrying out its safeguards activities, had not detected any diversion of a significant amount of safeguarded nuclear material from peaceful uses.

18. Major events have taken place however, since 1990, which have pointed to the need to strengthen the traditional approaches to NPT safeguards implementation, changed the expectations placed upon the safeguards system, led to specific measures designed to meet these new expectations, and resulted in new kinds of verification functions for the IAEA. These developments are described below.

A. The case of Iraq: violation of the NPT and the safeguards agreement

19. The discovery of Iraq's undeclared clandestine enrichment programme, of its nuclear weapons programmes, its violations of its comprehensive safeguards agreement with the IAEA and of its obligations under the NPT, showed that, although the IAEA's safeguards system remained effective in verifying the non-diversion of declared nuclear material at declared installations, its activities were not geared to the detection of undeclared activities.

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[3]The South Pacific Nuclear Free Zone Treaty, A/40/27, appendix II (CD/642), Vol. IV, document CD/633 and Corr.1; CD/633/Annex 4/Rev.1.

20. Acting under Chapter 7 of the United Nations Charter, the Security Council adopted on 3 April 1991 resolution 687 (1991). Paragraph 12 of the resolution called for Iraq unconditionally to agree not to acquire or develop nuclear weapons or nuclear weapons-usable material or any subsystems or components or any research, development, support or manufacturing facilities related to the above; to submit to the Secretary-General and the Director General of the IAEA a declaration of the locations, amounts, and types of all items specified above; to place all of its nuclear-weapons-usable material under the exclusive control of the International Atomic Energy Agency, for custody and removal, and to accept on-site inspection and the destruction, removal or rendering harmless, as appropriate, of all items specified in the resolution. In accordance with paragraph 13 of the resolution, the Director General was to develop a plan to carry out these steps as well as a plan for the ongoing monitoring and verification of Iraq's compliance with the above, including an inventory of all nuclear material in Iraq subject to the Agency's verification and inspections to confirm that Agency safeguards cover all relevant nuclear activities in Iraq.

21. Following the adoption of the resolution, the Director General established, in April 1991, an Action Team responsible for the planning, coordination and management of actions to be performed by the IAEA pursuant to resolution 687.

22. Since 1991 the IAEA has conducted [30] inspections, as a result of which the IAEA has uncovered Iraq's clandestine nuclear weapons programme, identified violations by Iraq of its obligations under its safeguards agreement with the IAEA (INFCIRC/172), drawn a coherent and consistent picture of the Iraqi nuclear programme, and destroyed, removed or rendered harmless all nuclear-weapons-usable material, as well as facilities and equipment related to Iraq's nuclear weapons programme.

23. On the basis of Iraq's early declarations, and the first IAEA inspection missions in Iraq, it was concluded, in GOV/2530 (16 July 1991) and GOV/2530/Add.1 (9 August 1991), that Iraq had violated its obligations under its Safeguards Agreement with the IAEA (INFCIRC/172). Specifically, Iraq had failed to report to the IAEA the presence in Iraq of nuclear material required to be safeguarded under the Agreement. In addition, Iraq had failed to notify the IAEA of the separation of a few grams of plutonium, and of its uranium enrichment programme which, according to Iraq's original declaration of 7 July 1991, had produced approximately a half-kilogram of enriched uranium. Iraq was later found to have been in further non-compliance with the Agreement, having failed to declare the fabrication of

natural uranium oxide fuel, the irradiation of undeclared fuel in the IRT-5000 Research Reactor at Tuwaitha, and the reprocessing of the irradiated fuel for the extraction of an additional 3 grams of plutonium.

24. Condemning Iraq's failure to comply with its obligations under the Safeguards Agreement and its commitments as a party to the NPT, and noting with grave concern Iraq's repeated attempts to conceal its activities and its failure to comply with its obligations under resolution 687, the Security Council, on 15 August 1991, adopted resolution 707 (1991), in which the Council, inter alia, demanded that Iraq halt all nuclear activities of any kind, except for use of isotopes for medical, agricultural or industrial purposes until the Security Council determines that Iraq is in full compliance with resolution 707 and paragraphs 12 and 13 of resolution 687 (1991). and the IAEA determines that Iraq is in full compliance with its safeguards agreement with the IAEA.

25. Subsequent inspection missions yielded conclusive evidence that Iraq had had a major programme to design and develop nuclear weapons, closely integrated into its programmes to produce enriched uranium.

26. In accordance with resolution 687, the IAEA took steps to destroy, remove or render harmless all items covered by paragraph 12 of resolution 687 (1991). In addition to the destruction of components and equipment relevant to the EMIS and centrifuge enrichment programmes, key technical installations at the Al Atheer Tarmiya and Ash Sharqat sites were destroyed by October 1992. The removal from Iraq of all fresh and irradiated nuclear-weapons-usable-material, was completed in the first quarter of 1994.

27. In resolution 715 (11 October 1991), the Security Council approved the IAEA's plan for ongoing monitoring and verification of Iraq's compliance with its obligations under Section C of Security Council resolution 687 (1991) and with the requirements of Sections 3 and 5 of resolution 707 (1991) (S/22872/Rev.1/Corr.1), and requested the Director General of the IAEA to carry out, with the assistance and cooperation of the Special Commission, the plan submitted by the IAEA. The IAEA has, since early 1992, been gradually phasing in the elements of the plan. [By the end of September 1994] all the main elements of the IAEA's ongoing monitoring and verification plan had been set in place, including the presence in Iraq of resident inspectors. This situation has been accordingly reported to the Security Council.

B. Efforts to strengthen safeguards following the discoveries in Iraq

28. As a result of the discovery of Iraq's clandestine enrichment and nuclear weapons programmes, the IAEA has been actively engaged in efforts to strengthen the safeguards system. The aim is to develop a system that can provide assurance not only of non-diversion or misuse of declared nuclear material and facilities, but also assurance as to the absence of undeclared nuclear material and facilities. A number of measures have since been put in place; others are in prospect. The focus in these efforts is on access: to information, to sites and to the United Nations Security Council.

1. Access to information: Strengthening the Agency's information base

29. Measures have been put in place since the events in Iraq that seek to improve the Agency's information base, the underlying rationale being that the more that is known about a country's nuclear activities, the more comprehensive the analysis and verification can be and the greater the reassurance about non-diversion and the absence of non-declared activities.

30. The starting point is increased provision of information by the State itself, supplemented by information that the Agency obtains during its verification activities and other information available to the Agency through other sources.

31. As part of the Agency's efforts to strengthen its information base, the IAEA Board of Governors approved, in February 1992, a proposal to require the early provision to the Agency of information on the design of new and modified nuclear facilities, the aims being to reduce the likelihood of States obtaining new nuclear facilities without the Agency being aware of them, to remove any ambiguity regarding a State's intention to place new facilities under safeguards and to facilitate the development of the relevant safeguards approach.

32. In February 1993, the Board also endorsed a scheme under which States are requested to report on imports and exports of nuclear material and of certain equipment and non-nuclear material used in the nuclear industry.

33. The aim of such reporting, which is voluntary in nature and over and above the specific reporting requirements of safeguards agreements, is to strengthen safeguards through increased transparency. The IAEA now also systematically collects and analyzes information available in the media and in other open source literature about States' nuclear activities. The IAEA is also being given access to other information obtained by Member States.

2. Access to Sites

34. Inspector access to carry out routine inspections under comprehensive safeguards agreements is limited to "strategic points" in declared facilities, such points being defined as those to which access is necessary for the implementation of safeguards measures. The Iraq experience showed that access limited to strategic points within safeguarded facilities was insufficient to permit the Agency to detect undeclared activities. Accordingly, in February 1992, the Agency's Board of Governors affirmed the IAEA's right, as provided for in its safeguards agreements, to conduct special inspections. Under such inspections the IAEA has the right to have access to additional information and locations which it determines as necessary for it to fulfil its obligations under such agreements.

3. Access to the Security Council

35. In the event a State does not comply with its safeguards obligations, the Agency is under an obligation to report such non-compliance to the United Nations Security Council. This is provided for in the IAEA Statute and in the Safeguards Agreements. In its Summit Statement of 31 January 1992 the Security Council, in emphasizing the integral role of fully effective IAEA safeguards in implementing the NPT, underscored the Council's readiness to take "appropriate measures in the case of any violations notified to them by the IAEA".

36. The relationship between the Agency and the United Nations has become closer. Its elements include a sound working relationship between the Agency and UN Secretariat, and as appropriate the provision of written reports and informal briefings to the Security Council. In the area of nuclear non-proliferation the Agency and Security Council have complementary roles. The Security Council needs the Agency's technical capability and expertise to verify compliance; the Security Council provides authority and power to ensure compliance with safeguards obligations.

C. The Democratic People's Republic of Korea: the problem of ensuring compliance

37. The DPRK acceded to the NPT in 1985. However it concluded the required safeguards agreement with the Agency (INFCIRC/403) only in April 1992. The first inspections in the DPRK took place in mid-1992 and were aimed at verifying the information in the DPRK's initial report and the facility design information.

38. Inconsistencies began shortly to emerge between the DPRK's declaration and the Agency's findings, centering on a mismatch between plutonium and nuclear waste solutions declared and

presented to the Agency and the results of Agency analysis. The latter suggested that there existed in the DPRK undeclared plutonium (whether in gram or kilogram quantities), as well as nuclear waste the analysis of which might help to clarify the plutonium issue. The Agency also received information about undeclared sites in the DPRK that seem to be related to the storage of nuclear waste.

39. Over many months, the Agency tried, unsuccessfully, to obtain clarifications from the DPRK about the inconsistencies, inter alia requesting - but not being granted - access to the two apparently waste-related sites. The assumption was, as in other cases where inconsistencies arise, that the inspected party has a self interest in rapid and effective clarification. When every effort to resolve the matter informally had failed, the Director General decided in February 1993 that it was necessary to invoke the special inspection procedure provided for in the DPRK's Safeguards Agreement with a view to seek access to additional information and locations.

40. Notwithstanding the Agency's Board of Governors' resolution of 25 February 1993, in which the Board decided that access to the information and sites "is essential and urgent in order to resolve differences and ensure verification of compliance with INFCIRC/403", the DPRK would not agree to such access, on the grounds that the sites concerned were non-nuclear and military. On 12 March 1993, the DPRK announced its decision to withdraw from the NPT.

41. Despite further resolutions of the IAEA Board (on 18 March and 1 April 1993), the DPRK continued to refuse to permit the Agency to take the measures requested with a view to resolving the differences and to ensuring verification of the DPRK's compliance with its Safeguards Agreement. In keeping with Article XII.C of the Agency's Statute, and as provided for in Article 19 of the DPRK's Safeguards Agreement, the Board referred the DPRK's non-compliance with its Agreement to the United Nations Security Council. In its resolution 825 (1993) of 11 May 1993, the Council called upon the DPRK to comply with the Agreement, and requested the Director General to continue to consult with the DPRK with a view to resolving the issues which were the subject of the Board of Governors findings. Despite the Agency's efforts in this regard, including its offer to arrange for "managed" access to the sites described as military by the DPRK, no progress has been made.
[NB. This will need additions/updating in due course]

42. Over and above the inconsistencies which led to the Agency's request for a special inspection, and which centered on the possible existence of undeclared nuclear material and activities, difficulties arose over routine safeguards implementation relevant to declared nuclear material and

facilities. An Agency inspection team visited the DPRK in May 1993 during which time it performed necessary work relating to containment, surveillance and maintenance activities. In June 1993 the DPRK announced its decision to suspend "the effectuation" of its NPT withdrawal. However, in August when Agency inspectors were admitted entry to the DPRK to perform inspections activities, their activities were restricted to replacing video films and power supply batteries.

43. An Agency delegation visited the DPRK from 1-3 September 1993 at the DPRK's suggestion. However, no progress was made in resolving safeguards implementation problems. When the Agency sent formally to the DPRK a detailed list of inspection activities which needed to be carried out in accordance with the Agency's technical requirements, the DPRK took the view that, having suspended the "effectuation" of its NPT withdrawal, it was in a unique position. It was prepared to allow the Agency only to maintain "continuity of safeguards". The DPRK defined "continuity of safeguards" as the maintenance of Agency containment and surveillance devices and distinguished it from "full implementation of the Safeguards Agreement", a matter which the DPRK considered had to be debated and solved in the context of the DPRK/US political talks.

44. The Agency's view, expressed by its Board of Governors, and its General Conference (in September 1993) and confirmed by the Security Council, is that, when the DPRK suspended the "effectuation" of its withdrawal from the NPT, its obligations as a party to the Treaty continued. Accordingly, the Safeguards Agreement between the IAEA and the DPRK remains fully operative and has to be fully implemented. The Agency cannot accept linkages between the scope of its inspection activities and progress in bilateral political talks.

45. With no inspection activity having taken place in the DPRK since September 1993, and because of the restrictions imposed during earlier inspections, the IAEA Director General reported to the Agency's Board of Governors, in December 1993, that the safeguards system which had been in place on declared nuclear material and installations in the DPRK could no longer be said to provide any meaningful assurance of the peaceful use of those installations and material.

46. In January 1994, following further bilateral discussions with the United States, the DPRK indicated its readiness to accept inspection of declared nuclear material and installations required to provide "the continuity of safeguards". A detailed list of inspection activities was agreed upon on 15 February 1994.

47. Inspection activities began on 3 March 1994. However, at one of the seven declared facilities, a reprocessing plant known

as the Radiochemical Laboratory, Agency inspectors were denied access to perform certain required and agreed safeguards activities. When the Director General reported this to the Board of Governors on 21 March 1994, the Board adopted a further resolution which, inter alia, called upon the DPRK immediately to allow the IAEA to complete all requested inspection activities and requested the Director General to transmit the resolution inter alia to the Security Council. On 31 March 1994, a statement of the President of the Security Council called upon the DPRK to enable IAEA inspectors to complete the inspection activities outstanding since March.

48. Subsequently, important safeguards measures required, but initially blocked by the DPRK during the March inspection at the Radiochemical Laboratory were permitted on the basis of what the DPRK considered to be "a special exception" taking into account developments in its bilateral talks with the US.

49. The Director General invoked the special inspection provisions of the DPRK's safeguards agreement in February 1993 because access to additional information and location was and remains essential to the Agency's ability to verify the correctness and completeness of the DPRK's initial report, in particular as regards the quantity of plutonium produced in the DPRK. Vital in these contexts was the need for the Agency to ascertain, with confidence, whether the core of the DPRK's 5MWe Experimental Nuclear Power Reactor was the first core, as claimed by the DPRK.

50. On 19 April 1994, the DPRK notified the IAEA of its intention to carry out, "at an early date" the refuelling of the Experimental Nuclear Power Reactor, an operation which had been envisaged by the DPRK for over a year. As early as February 1993, the Agency gave the DPRK full information about safeguards measures required in connection with that refuelling stressing, inter alia, that specific safeguards activities - related to the selection, segregation and securing of certain fuel rods - would be indispensable at the time of the core discharge operation. The overall purpose of the measures was to enable the Agency to verify, through measurements at a later date, that no fuel in the reactor had been diverted in the past and that the fuel discharged was indeed the first core of the reactor as declared by the DPRK.

51. When the DPRK put the Agency on notice, on 12 May 1994, that it had already started the refuelling campaign, the IAEA confirmed to the DPRK that the discharge of fuel without the safeguards measures requested constituted a serious violation of the DPRK's safeguards agreement, requested that arrangements be made promptly for the necessary safeguards measures and urged that, until these were in place, further discharge should be deferred. The DPRK declined to accede to this request but

nevertheless agreed to receive Agency officials to discuss the issue. However, although an Agency team had extensive discussions with DPRK officials from 25 - 27 May in an attempt to reach agreement about how to proceed with the implementation of the safeguards measures required, no agreement was reached. The Agency concluded that, if the discharge of fuel from the reactor were to continue at the same pace as it had proceeded up until the time of the Agency team's visit, the opportunity to select, segregate and secure fuel rods for later measurements in accordance with Agency standards would be lost within days.

52. On 30 May 1994, a statement of the President of the Security Council said, inter alia, that "the Council strongly urges the DPRK only to proceed with the discharge operation at the 5MWe Reactor in a manner which preserves the technical possibility of fuel measurements, in accordance with the IAEA's requirements in this regard" and that "the Council calls for immediate consultations between the IAEA and the DPRK on the necessary technical measures". In response to this statement, the Agency put forward three viable options. If any one of those options had been accepted by the DPRK, it could have prevented further erosion of the Agency's future ability to assess the history of the reactor core and could have ensured that such ability as still then existed would have been preserved. The Agency had concluded that there were no technical or safety-related reasons against acceptance of any one of the three options. As for a proposal which the DPRK had put forward to the Agency with the purported aim of preserving the Agency's possibility to make later measurements of fuel rods, the Agency explained that the proposal was not viable because it would not have permitted the Agency independently to ascertain whether nuclear material from the reactor had been diverted in past years.

53. Despite the Agency's efforts, the limited opportunity which had remained for it to select, segregate and secure fuel rods for later measurements was lost. The situation resulting from the core discharge was irreversible and seriously eroded the Agency's ability to undertake further measures crucial to its ability to ascertain whether all the plutonium produced in the DPRK had been declared to the Agency i.e. to achieve the overall objective of comprehensive safeguards, namely to provide assurance about the non-diversion of nuclear material. In a further resolution of the Board of Governors on 10 June 1994, the Board inter alia found that the DPRK was continuing to widen its non-compliance with its safeguards agreement, decided, in conformity with the provisions of Article XII.C of the IAEA Statute, to suspend non-medical Agency assistance to the DPRK and asked the Director General to transmit the resolution to all Members of the Agency, to the Security Council and to the United Nations General Assembly. **[update as necessary]**

D. South Africa: Establishing the nuclear inventory of State with sizeable nuclear activities; verifying the termination of a nuclear weapons programme

54. When South Africa concluded its safeguards agreement with the IAEA in 1991, the Agency was confronted with the situation that major nuclear facilities, including one plant for the production of highly enriched uranium, had previously operated outside any kind of international control for many years. South Africa submitted to the Agency in October 1991 its initial report on the inventory of its nuclear material, and safeguards implementation began in November 1991.

55. The extensive nuclear fuel cycle made verification of the completeness and assessment of the correctness of the inventory complex, requiring considerable inspection resources and extensive cooperation from the State authorities in providing access to defunct facilities and historical operating and accounting records. The South African authorities facilitated access to any locations and information that the Agency specifically requested.

56. The Agency concluded in 1992 that it had found no evidence that the list of facilities, locations and inventories of nuclear material provided by South Africa in its initial report was incomplete.

57. In conjunction with the implementation of the safeguards agreement and at the invitation of the South African Government the IAEA has carried out an assessment of the status of South Africa's former nuclear weapons programme. The IAEA sent experts, who visited the facilities involved in the abandoned programme and reviewed associated historical data with the purpose of observing that the programme had been terminated and of verifying that all the nuclear material used in it had been fully accounted for and placed under Agency safeguards. South Africa arranged access to any location for which access was requested by the IAEA, including military installations and ammunition factories.

58. In September 1993 the Agency reported that its audit of the associated records indicated that all enriched material, including the HEU, involved in South Africa's former nuclear weapons programme was subject to IAEA safeguards at the time of entry into force of the safeguards agreement; it also concluded that there was no indication to suggest that substantial amounts of depleted or natural uranium used in the nuclear weapons programme were unaccounted for.

59. The experience in South Africa demonstrated clearly the technical difficulties in verifying the initial report of States

having significant nuclear activities not previously under safeguards. Even more important, the experience demonstrates that, full cooperation by the States, in particular in providing access to information and sites, is a necessary prerequisite of successful verification of a large initial inventory.

E. Other aspects of NPT safeguards in a changed political environment

1. The application of safeguards in the Newly Independent States of the former Soviet Union

60. A consequence of the dissolution of the former Soviet Union was the emergence of fifteen newly independent States (NIS). All, with the exception of the Russian Federation, have declared their intention to become non-nuclear-weapon States. So far, nine - Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Latvia, Lithuania, and Uzbekistan - have acceded to the NPT. Russia has succeeded as a nuclear-weapon State to the rights and obligations of the former Soviet Union under both the NPT and the Soviet Union's voluntary offer safeguards agreement.

61. To help these States meet their nuclear non-proliferation obligations, the IAEA embarked, in 1992, on a number of activities to help them establish and/or further develop sound State systems of nuclear accountancy and control (SSACs); measures for the physical protection of nuclear materials; and mechanisms for import and export control.

62. Preparatory work in connection with the introduction of comprehensive safeguards in the NIS consisted of fact finding/technical visits and coordinated technical support. In 1992-1994 such visits were carried out in 12 NIS, including all with relevant nuclear activities. Facilities to be safeguarded, relevant contact persons and organizations, and technical support requirements were identified.

63. Safeguards equipment needs were identified and budgeted for, and initial purchases made for longer lead-time items. Inspection resource requirement estimates were drawn up, based upon draft safeguards approaches prepared or updated for all major NIS facility types. IAEA inspection procedures were reviewed in detail with facility operators. Consultations about legal aspects of safeguards agreements and about facility design verification procedures also took place.

64. In the framework of a coordinated support programme for those NIS with nuclear programmes, the Agency compiled and sent to potential donors and recipients a "Needs List" of NIS

requirements for effective safeguards implementation. The IAEA also helped to prepare coordinated technical support plans for future safeguards implementation in Belarus, Estonia, Latvia, Lithuania, Kazakhstan and Ukraine.

65. Ukraine informed the IAEA, in September 1992, that "Ukraine has begun the preparatory steps with the aim to adhere to the Non-Proliferation Treaty as a non-nuclear State and requested that, "in the transitional period, before finishing juridical procedures necessary for Ukraine to adhere to this Treaty" ... "safeguards of the Agency be applied to the nuclear installations under the jurisdiction or control of Ukraine." Accordingly, the IAEA undertook preparatory measures necessary for the application of NPT safeguards in Ukraine, and carried out technical visits with a view to performing verification activities similar to those provided for in INFCIRC/153.

66. In November 1993, the Government of Ukraine expressed its wish to conclude a safeguards agreement applying to "all nuclear materials used for peaceful purposes in Ukraine". Following submission by the IAEA, in January 1994, of the text of a draft comprehensive safeguards agreement for the Government's consideration, negotiations between the Ukraine and the IAEA concluded in June 1994. Under the safeguards agreement, if confirmed by the Government of Ukraine and approved by the IAEA Board of Governors in September 1994, Ukraine would undertake to use the nuclear material and facilities under its jurisdiction or control exclusively for peaceful purposes. It would also provide for the application of safeguards by the IAEA to all nuclear material in all peaceful nuclear activities in Ukraine.

2. Regional non-proliferation initiatives

67. Article VII of the NPT provides that, "Nothing in this Treaty affects the right of any group of States to conclude regional treaties in order to assure the total absence of nuclear weapons in their respective territories." Regional arrangements are a means through which confidence in and between the States of a specific region can be established and nurtured.

68. The Treaty-based NWFZs established or in prospect provide for verification arrangements closely linked with safeguards implementation pursuant to the NPT. For example the safeguards agreements which States Parties to the Rarotonga Treaty must conclude with the IAEA "shall be, or shall be equivalent in its scope and effect to, an agreement required in connection with the NPT on the basis of the materials reproduced in Document INFCIRC/153 (corrected) of the IAEA". Also, most safeguards agreements between the IAEA and the States party to the Treaty of Tlatelolco were concluded in connection with both the

Tlatelolco Treaty and the NPT. Parties to future NWFZs will no doubt also develop specific verification scenarios based on their own regional requirements. As more and more States become parties to different non-proliferation initiatives, and will thereby be covered by the verification measures pursuant to such initiatives, the complementarity between regional nuclear verification and activities and the global system implemented by the IAEA could open up further possibilities for effective and cost-efficient verification of compliance with States' non-proliferation undertakings.

3. Trafficking of nuclear material

69. As a result of the dissolution of the former Soviet Union, there is concern that nuclear material and technology as well as nuclear engineers and scientists might trickle out to any State interested in acquiring a nuclear-weapon capability. Fundamental to the prevention of such eventualities are remedies which lie beyond the scope of Agency safeguards such as effective export controls, finding suitable, alternative employment for nuclear experts and, fostering or creating disincentives to proliferation in potential recipient States. Nevertheless, cases of trafficking in nuclear material are of concern to the IAEA especially where the material is of safeguards significance and should be declared to the Agency.

70. The IAEA follows up reports in the public media and from States about alleged incidents of trafficking in nuclear material. During calendar year 1993 the Agency was informed officially, either by the State or facility involved about eleven specific incidents. In all cases they involved small quantities of nuclear material. In all but one of the nine incidents in which material was recovered, the recovered material had been placed under Agency safeguards by the end of 1993.

V. Review, Responsiveness and Assessment

A. Safeguards Effectiveness

71. The IAEA safeguards system has been designed to provide a high level of confidence, and its effectiveness has, over the years, improved substantially. Effectiveness is represented most directly but not completely by the extent of inspection goal attainment, as reported each year in the Agency's Safeguards Implementation Report (SIR) submitted to its Board of Governors. Attainment of inspection goals engenders confidence in safeguards conclusions of non-diversion of declared nuclear material and represents successful conduct of an extensive set of inspection activities which, collectively, provide a

capability for detecting diversion should it occur. In addition, all instances of non-attainment of inspection goals, as well as all anomalies and discrepancies arising from safeguards activities, are carefully assessed in the process of drawing the overall annual safeguards conclusion.

72. In 1977, the first year in which the SIR was produced, the inspection goal for all types of nuclear material was attained at 17 percent of the facilities inspected and evaluated. This increased to 47 percent in 1980, to 57 percent in 1985 and to 83 percent in 1990. During this period the number of facilities with goal attainment increased from 26 to 239. Real improvements in effectiveness were actually greater than these figures suggest because procedures for carrying out inspections and for evaluating goal attainment were made more rigorous. Since 1990, the percentage of overall inspection goal attainment has fallen, reflecting, inter alia, a reallocation of inspection effort and resource constraints.

73. The Third Review Conference recognized the particular requirements for safeguards on direct-use nuclear material. Thus, as called for by safeguards agreements and urged by Member States, the IAEA has given priority to nuclear material from which nuclear weapons could readily be made, i.e., plutonium and highly enriched uranium. As a consequence, attainment of inspection goals for separated plutonium and highly enriched uranium has increased to, and been maintained at, over 90 percent of the facilities having such materials. This demonstrates the high level of effectiveness which can be achieved, even at the most complex types of facilities, with sufficient resources. It also reflects the considerable work which the IAEA has undertaken, to ensure the continuing effectiveness of safeguards in relation to reprocessing and the storage and use of separated plutonium.

74. At previous Review Conferences States Parties have called for increasing the effectiveness of safeguards and have also called upon the Agency to make full use of its rights. As the safeguards strengthening measures already taken are implemented and as the further safeguards strengthening measures described in paragraphs 119 to 127 are developed, a broadened evaluation of safeguards effectiveness will assess the ability to detect not only any diversion of declared nuclear material but also the existence of undeclared nuclear activities. However, important though this latter capability is, providing assurance through effective safeguards that <u>declared</u> material is not diverted will continue to constitute the major part of IAEA safeguards work. Enhanced capability to detect undeclared nuclear activities can contribute to but cannot substitute for effective safeguards on declared material.

B. Efficiency

75. Efficiency is a measure of how well resources (staff, equipment, money) are used to fulfil the Agency's part in the implementation of safeguards. Safeguards efficiency is a matter of importance to both States and the Agency, and efforts, largely under the Agency's development programme, are continuing for improving efficiency as well as effectiveness. Improvements in efficiency, however, are more difficult to assess because they involve a diversity of factors, some of which, such as facility features and geography, are completely outside the Agency's control.

76. The most striking measurement is the monetary cost of safeguards per significant quantity (SQ) of nuclear material. This fell dramatically from $2200/SQ in 1981 and $2000/SQ in 1985 to $1100/SQ in 1990 and to less than $850/SQ in 1993. (All dollar values here and in the following paragraphs are adjusted for inflation and exchange rates to 1993.) While this improvement in efficiency is impressive, it is due in large part to economies of scale rather than to the changes that have occurred in safeguards policies and practices.

77. The impact of safeguards policies and practices may be seen in other measurements of efficiency in particular the monetary cost of safeguards per facility. In 1981 the cost (in 1993 dollars) was $169,000/facility. By 1985 this had risen to roughly $220,000/facility. With minor yearly fluctuations, it has remained at this level despite the increased size and complexity of the newer facilities and the much larger amounts of nuclear material they contain.

78. The relationship of efficiency and resource availability is shown graphically in figure 1. Expenditures for safeguards (in 1993 dollars) rose gradually until 1985 at which time they levelled off. As a consequence, the inspection effort which the IAEA has been able to field rose steadily until 1989-1990, when it reached over 10,000 person-days. Then, continuing resource constraints began to bite and inspection effort, due in part to insufficient funds, began to fall. In parallel, the percentage of facilities at which the inspection goal was fully attained rose steadily, reaching a peak of 83 percent in 1990 and then falling to 68 percent in 1993.

C. Responsiveness of Safeguards

79. Comprehensive safeguards agreements impose a number of obligations on the IAEA to respect the interests of the State. The final documents of NPT Review Conferences have reflected the importance that States Parties attach to these requirements. In the implementation of safeguards the IAEA has endeavoured to satisfy these requirements and the underlying concerns of the

Parties and has made modifications and additions to its practices to adjust to new and changing circumstances. The following paragraphs summarize the responsiveness of the IAEA safeguards system to these requirements.

1. Avoidance of hampering and undue interference in States' peaceful nuclear activities

80. Paragraph 4 of INFCIRC/153 requires that safeguards be implemented in a manner designed to avoid hampering the economic and technological development of, and to avoid undue interference in, the State's peaceful nuclear activities. The IAEA has consistently striven, within the constraints of fulfilling its obligations, to satisfy this requirement. It has done this, inter alia, by introducing as much flexibility as possible, consistent with effective safeguards, in safeguards implementation practices and procedures, e.g., in adapting the details of safeguards activities to the circumstances of individual facilities.

81. Consistency and predictability in the Agency's criteria for implementing safeguards benefits operators and States. To that end, the IAEA in 1991 introduced a comprehensive set of safeguards criteria used for the planning of safeguards implementation activities during 1991-1995. A further increasingly important means of avoiding undue interference with facility operations is the use of unattended safeguards instrumentation and containment and surveillance equipment. The IAEA will continue its efforts in this regard. This aspect of safeguards is a feature of the development programme described in paragraphs 119 to 127 which also includes increased cooperation with States in the conduct of inspections.

2. Protecting commercial and industrial secrets and other confidential information

82. Paragraph 5 of INFCIRC/153 requires the IAEA to take every precaution to protect commercial and industrial secrets and other confidential information coming to its knowledge in the implementation of safeguards agreements. The IAEA Statute obliges all staff to refrain from disclosing information coming to their knowledge through their official duties. The employment contracts obligate IAEA staff not to disclose such information, an obligation that does not lapse upon termination of employment. In addition, the IAEA has developed and strengthened an extensive system of internal controls and procedures to protect the information.

83. This protection extends to information relating to the design of nuclear facilities; to the quantity, location, composition and movement of nuclear material; to the safeguards approach and inspection goals for specific facilities; and to

the results of inspections, including any anomalies and incidents at nuclear facilities. All such information is available to staff members only on a "need to know" basis, is kept under lock when not in use, is not left unattended and is destroyed by shredding when no longer needed. Certain highly sensitive information, such as completed Design Information Questionnaires (DIQs), advance notifications of international transfers of direct-use material and special reports, is given a higher level of protection and is transferred among IAEA staff only against signature. Samples of nuclear material for analysis are coded to avoid disclosure of information about the nuclear material at specific facilities.

3. Staffing standards and geographical distribution

84. The Final Documents of previous Review Conferences have emphasized the importance of the IAEA recruiting and training staff of the highest professional standards for safeguards implementation with due regard to the widest possible geographical distribution. This is also in keeping with the IAEA Statute, which states in its 'Article VII.D that the paramount consideration in the recruitment and employment of staff "shall be to secure employees of the highest standards of efficiency, technical competence and integrity." Due regard is being given, subject to this consideration, to recruiting staff on as wide a geographical basis as possible.

85. Earlier difficulties in recruiting inspectors from developing countries stemmed from the limited opportunities which applicants from developing countries had to acquire the necessary professional experience. The Agency has contributed towards overcoming this problem through its Safeguards Training Programme for Junior Professional Staff from countries receiving technical assistance from the Agency. Training covers nuclear technologies and Agency safeguards practices. The course has been held eight times since 1983, most recently as a 10-month course in 1993, and has involved some 60 trainees, of whom 26 were subsequently recruited as Agency inspectors and 2 to positions in the Safeguards Support Divisions. In addition, a number of trainees, on completing the course, returned to their home countries to take up employment with their SSACs, thereby also contributing to the safeguards system.

86. There are currently 255 staff members approved by the Board of Governors to be inspectors and inspector assistants. Of these, 205 are in the Divisions of Operations and perform routine inspection work. 74 (36%) of them come from countries in the Group of 77 and 26 more (13%) from other countries that can be regarded as developing. This combined total of 49% of the IAEA safeguards inspectorate drawn from developing countries has risen from 42% in 1985 and 44% in 1990. The 255 inspectors

and assistants approved have been recruited from 70 countries (51 of which are developing countries).

4. Cooperation with State Systems of Accounting and Control (SSACs)

87. Comprehensive safeguards agreements call for cooperation between the IAEA and the States to facilitate the implementation of safeguards; SSACs are the primary vehicle for this cooperation on the part of States. Past NPT Conferences have recognized the importance of SSACs to effective and efficient safeguards. The IAEA has been the first to recognize the basic value to safeguards of technically qualified SSACs, and for many years has carried out programmes to assist States in the development and implementation of their SSACs. These have included development of SSAC guidelines and the conduct of training courses for staff of SSACs. There have been 11 such courses with 292 participants from 52 States during just the past 5 years. As described in paragraphs 61 to 63 above, a major effort is now underway to assist the Newly Independent States (NIS) in the development of their SSACs. The IAEA is providing some of this assistance and is coordinating assistance by other States.

88. Another major effort was launched in 1992 to improve the efficiency of safeguards implementation in the European Union through increased cooperation between the IAEA and EURATOM. The European Community has had its own system of verification of nuclear activities since 1957. Since 1971, IAEA and EURATOM safeguards have performed safeguards in parallel to meet their respective obligations. The new initiative, called the Partnership Approach, has been prompted, among other reasons, by the desire of both inspectorates to conserve resources. In developing more efficient procedures, the IAEA has taken into account its requirement to draw independent conclusions. Significant reductions in the IAEA inspection effort were obtained from conforming IAEA inspection activities conducted with EURATOM to those in comparable facilities in other countries, aided by the shutdown of certain major facilities. Revised inspection activities have been defined which will maintain IAEA independence while avoiding duplication through technical measures and special arrangements; these are expected to lead to significant further reductions in IAEA inspection effort.

89. An important part of the IAEA's development programme is the investigation of possible further measures for increased cooperation with SSACs on a broader basis. The work builds on the advice of the Standing Advisory Group on Safeguards Implementation (SAGSI) on several forms of increased cooperation, including a number of practical steps SSACs could take to enable more effective and efficient safeguards, e.g. by

providing field support to Agency inspectors, and the concept of shared work where IAEA and SSAC inspectors work side by side. The technical capabilities and other characteristics of SSACs are being examined to help define specific possibilities for enhanced cooperation.

5. Pursuit of more cost-effective inspection procedures

90. Comprehensive safeguards agreements call for the IAEA to take full account of technical developments in safeguards - NPT Conferences have urged continued improvements in the effectiveness and efficiency of safeguards through new cost effective techniques, methods and approaches. In response, the IAEA maintains an active programme, largely in cooperation with Member State Support Programmes, to develop improved procedures. In 1991-1992 an extensive examination was made jointly with SAGSI of the possibilities for increased use of randomization, and several technically valid possibilities were identified. A field test in 1993 confirmed the validity of randomized inspection procedures for LEU fuel fabrication facilities. However, their implementation depends on the ability and willingness of the State and in particular the facility operators to implement the necessary special arrangements.

91. The IAEA has also made a significant effort to introduce the option of a "zone approach," in which several facilities with frequent transfers of nuclear material between them are considered together. The approach which allows a reduction in interim inspections has been implemented in some States for several years and is available for wider use where it would be cost-effective and acceptable to the State.

92. The practicality of a "mail in" concept for video surveillance records has been demonstrated. Under this concept, the SSAC or the facility operator mails in and replaces the tapes in video cameras, and is testing the real-time electronic transmission of video data. These represent combinations of new arrangements with States and new technologies that have the potential for significantly reducing the number of interim inspections at LWRs.

93. A major part of Programme 93+2 (paragraphs 119 - 127) is the investigation of other cost-effective advanced technologies and alternative procedures and approaches. As the investigation and its field trials progress and acceptability and utility are demonstrated, additional proposals will be developed and put forward for improving the cost-effectiveness of the safeguards system.

6. Concentration of verification on weapons usable material

94. Paragraph 6(c) of INCIRC/153 calls for the concentration of inspection effort on those stages of the nuclear fuel cycle handling nuclear material from which nuclear weapons could readily be made. As stated in paragraph 73 above, the Third NPT Review Conference has recognized the significance of these particular requirements and Agency safeguards approaches have been developed in conformity with them, concentrating inspection effort on unirradiated plutonium and HEU. For example, in 1993 an average of about 1 person-day of inspection (PDI) was devoted to each SQ of these types of material compared to only about 0.2 PDI for each SQ of indirect-use material (depleted, natural and low enriched uranium). These values are for facilities processing large amounts of nuclear material in bulk form. The effort devoted to irradiated direct-use material is substantially less -- about 0.07 PDI/SQ -- because safeguards on this material can be based on item accountancy and make extensive use of containment and surveillance.

7. Increased transparency of IAEA safeguards

95. The 1990 NPT Conference draft document recommended improvement in the transparency of presentation of the results of IAEA safeguards activities so that information on these results could be made available to the public to prevent possible misinformation and misunderstanding. Since 1977, the Safeguards Implementation Report (SIR) has been the main document for presenting safeguards results to the Board and Member States. During this period the information content of the SIR has been significantly increased and a number of improvements have been introduced to make the information presented more readily understood. At the same time the necessary balance between transparency and protection of confidential information has been maintained. The present contents of the SIR are such that, with the Board's agreement, SIRs could be made public without violating the provisions in safeguards agreements regarding the confidentiality of safeguards information. However, there have been and continue to be conflicting views among members of the Board regarding release to the public of the SIR.

96. Information on the results of safeguards in the form of the annual safeguards statement is made available to the public through the Annual Report. This includes the overall findings and conclusion.

8. New and complex facilities

97. The Final Documents of the NPT Conferences recognized the need for States to take IAEA safeguards requirements into

account in planning, designing and constructing new fuel cycle facilities and/or modifying existing ones, and the need for IAEA safeguards approaches to be capable of dealing adequately with the types of facilities under safeguards. A continuing challenge for the IAEA and Member States has been to prepare for and implement safeguards at new and complex nuclear facilities. Facilities under safeguards have expanded from the research and power reactors in the early days to include enrichment plants employing several different enrichment technologies, large-scale automated reprocessing plants, and MOX fuel fabrication plants involving remote handling, among others.

98. The IAEA, with the considerable assistance of Member States Parties to the NPT, has been able to take advantage of modern technology, automation, improved software, remote sensors and other surveillance devices, non-destructive measurement devices and interrogable seals. Successes in these fields have enabled the IAEA to reduce the number of inspections, to carry them out more efficiently (thereby reducing the inspection effort), and in some cases to perform verifications which otherwise would not have been possible.

99. The major challenge facing the IAEA in the next years is to prepare for and implement effective safeguards at a large commercial reprocessing facility. This will require a large investment of staff and money. Strong support from Member States will be needed for the IAEA to make that happen.

9. Voluntary offer agreements with NWSs

100. Nuclear-weapon States (NWSs) Parties of the NPT are not committed by Article III to conclude safeguards agreements with the IAEA. These States have, however, offered parts or all or their civilian nuclear fuel cycles for safeguards by the Agency. Voluntary offers of this kind have been concluded with each of the five NWSs[4]. The NPT Conference Final Documents urged NWSs to continue to cooperate fully with the Agency in implementing their voluntary offer agreements, which were regarded "as further strengthening the non-proliferation regime and increasing the authority of the IAEA and the effectiveness of its safeguards system". The Fourth Conference draft document also called on the NWSs who had not already done so to extend their offers to all of their peaceful nuclear facilities and urged the NWSs to offer for verification any nuclear material and facilities transferred from military use to peaceful use.

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[4]Between the IAEA and the United Kingdom (1978), the United States (1980), France (1981), the former Soviet Union, now Russia (1985) and the People's Republic of China (1989).

101. The implementation of the voluntary offer agreements depends on the terms of each agreement, and, as has been demonstrated recently, on Agency budgetary constraints. Since 1991, inspection effort in these States has been minimized, reaching the point in 1993 where there were no inspections in one of the NWSs. In 1994 preparations were initiated to reactivate in 1995 inspections under the voluntary offer agreements, in the expectation that the Agency could return to normal budget implementation in 1995 (i.e., no reduction in its approved financial plan due to deferred payments by Member States). In 1994, the United States made a unilateral offer to place excess weapons material under safeguards, an offer which will be effectuated through the voluntary offer agreement, with inspections expected to begin during the last part of 1994.

VI. Safeguards Workload and Resources

A. Workload

102. As of 30 June 1994, 196 safeguards agreements with 117 States were in force. This includes 99[5] comprehensive safeguards agreements with 106[6] States of which 104 are parties to the NPT (including three States[7] whose comprehensive agreements are not pursuant to the NPT). Voluntary offer safeguards agreements are in force with all five of the nuclear-weapon State Parties. There have been 12 new agreements pursuant to the NPT since 1990. The number of States in which safeguards are applied has continued to increase gradually (57 in 1985 increasing to 60 in 1993). However, 57 non-nuclear-weapon States party to the NPT have not yet concluded the relevant safeguards agreements with the Agency.

103. The number of nuclear facilities under safeguards or containing safeguarded nuclear material has increased at a somewhat greater rate (averaging almost 10 facilities yearly).

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[5]This figure includes 93 agreements pursuant to the NPT or to the NPT and Tlatelolco; 3 agreements pursuant to Tlatelolco; 1 agreement pursuant to the Additional Protocol I of Tlatelolco; 1 agreement for Albania; 1 for Argentina and Brazil, (Quadripartite Agreement).

[6]This figure includes 101 States with safeguards agreements pursuant to the NPT; 2 States, Colombia and Panama, with safeguards agreements pursuant to Tlatelolco; 2 States, Argentina and Brazil, with agreements pursuant to the Quadripartite Agreement; and Albania.

[7]Albania, Colombia, Panama.

By the end of 1993 there were 167 power reactor facilities, 156 research reactor (and critical assembly) facilities, 175 other facilities (notably conversion, fabrication, enrichment, reprocessing and storage facilities) and 324 locations outside facilities under safeguards. An increase, including two enrichment plants, has already occurred in 1994 with the entry into force of the comprehensive safeguards agreement with Argentina and Brazil. Further significant increases are anticipated with additional safeguards agreements with the NIS. These increases in the numbers of facilities do not reflect the full extent of the work load increase resulting from the replacement of older and smaller facilities by larger and more complex facilities.

104. Much larger increases have occurred in the amounts of nuclear material under safeguards. The increases which have the greatest impact on the safeguards work load involve plutonium and are shown in figure 2. The amounts of unirradiated plutonium outside reactor cores and of irradiated plutonium (spent fuel) have roughly tripled since 1985. Unirradiated plutonium, which requires the most intensive safeguards, has already doubled since 1990. Forecasts show no abatement in these increases. In fact, beginning in 1994 there are expected to be additional increases, beyond this regular growth, by the application of safeguards in one nuclear-weapon State to unirradiated plutonium and highly enriched uranium excess to that required for its nuclear weapons programme. Aside from this latter increase, the amount of highly enriched uranium under safeguards (9.8 tonnes in 1993) has remained fairly constant.

105. Substantial increases have also occurred in the amounts of indirect-use material under safeguards. At the end of 1993 there were 39,000 tonnes of low enriched uranium under safeguards, having increased from 25,000 tonnes in 1985 and 36,000 tonnes in 1990. Similarly, there were 86,000 tonnes of source material under safeguards in 1993, compared to 43,000 tonnes and 62,000 tonnes in 1985 and 1990, respectively. These quantities are also projected to continue to increase.

B. Resources

106. Past NPT Conferences have recognized the need for the IAEA to be provided with the necessary financial and human resources "to ensure that the Agency is able to continue to meet effectively its safeguards responsibilities...". Notwithstanding, despite the increase in the amount of material, and in the number and, especially, the complexity of facilities to be safeguarded, IAEA Member States have applied a policy of zero real growth to the IAEA's budget, which has not increased in real terms since 1985. The safeguards expenditures of the

Agency were $61.8 million in 1993 and $61.6 million (in 1993 dollars) in 1985 and averaged $60.4 million in between. Member States have supplemented these resources with voluntary support to safeguards in the form of expertise, equipment and analytical services.

107. While the expenditures for IAEA safeguards have not increased over that period, the safeguards workload parameters have, some to a sizeable extent. The continuation of such resource constraints over many years has resulted in reduced performance, both in efficiency (person days of inspection) and effectiveness (inspection goal attainment).

108. Adding to the difficulty imposed by a zero real growth policy have been several years of forced reductions in the IAEA financial plan to levels below the approved budgets (13 percent in 1992, 12 percent in 1993 and 12 percent in 1994). These reductions have disrupted planning, caused the cancellation of inspections, led to deferment of recruitment and prevented orderly procurement and replacement of safeguards equipment.

109. Thus, a major consequence of the budgetary situation has been that the number of staff of the Department of Safeguards and the number of approved inspectors are now the same as in 1987, having gone up slightly and then fallen in the intervening period. The available inspector-years were the same in 1993 as in 1988, having fallen by 5.7% from its peak in 1991. New inspectors were hired in 1994, for the first time in two years, to respond to the increasing work load in the next years.

110. Economic factors are affecting the geographical mix of the IAEA staff working in safeguards. Salaries in the UN system have not kept up with those in industrialized countries and other international organizations; this represents a disincentive for applicants from industrialized countries. On the other hand the economic situation in certain States has in recent years led highly qualified persons to seek employment in the IAEA, even in lower positions. Budget limitations have also led the IAEA to increase its reliance on cost free experts (there are over 30 working on safeguards), who come from a limited number of States.

111. Because of such resource shortages, the IAEA has been unable in recent years to carry out all of the necessary inspection activities to the required high standard and has been faced with equipment availability and reliability problems, all of which has resulted in the non-attainment of inspection goals. The effects of developments such as these have been only partially offset by factors such as the shut down of several facilities handling plutonium and high-enriched uranium and the success of efforts to improve efficiency in the EURATOM area. Without those events, it would not have been possible for the

IAEA to meet new demands over the past four years without more drastic adverse effects on safeguards effectiveness and assurance.

C. Workload and Resource Projections in the Near Term

112. The situation in the near future looks difficult with new and ever-increasing demands being made upon the Agency's safeguards system largely (but not exclusively) related to the NPT. Included in the former category is the expected initiation of NPT safeguards in several NIS, in the course of which the IAEA will face the prospect of large pre-existing nuclear programmes requiring resource-intensive verification of the completeness of initial reports.

113. A conservative projection indicates the need to increase the IAEA inspectorate by at least 20 inspectors over the next three years; accompanying that should be the filling of at least 10 of the vacant posts for support staff. That would require an annual real increase in the budget for safeguards on the order of 3-5% each year for the next three years. While this increase should allow the new work load to be met, it may not be sufficient to turn around the decline in inspection goal attainment.

114. In a year or two, it will be possible to take stock again. By that time, the precise picture with regard to some of the situations described above should be clearer, as should be the impact on resources of the modifications to be made to the safeguards system.

VII. Safeguards in the Future

115. Previous NPT conferences have expressed or reaffirmed the conviction that IAEA safeguards play a key role in preventing nuclear proliferation. Through providing assurance that States are complying with their undertakings and by assisting States in demonstrating that compliance, safeguards promote further confidence among States and, as a fundamental element of the NPT, help to strengthen the collective security of the States Parties. States party to the Treaty have commended the IAEA on its implementation of safeguards pursuant to the NPT and urged the Agency to take full advantage of its rights. In 1991, the IAEA Board of Governors confirmed the Agency's right to carry out special inspections.

116. The NPT conferences have also welcomed the significant contributions made by States Parties to the Treaty in facilitating the application of IAEA safeguards and in

supporting research, development and other supports to further the application of effective and efficient safeguards. In this context, the conferences have recognized the critical importance of States continuing their political, technical and financial support for the safeguards system, including playing their full part in helping the IAEA to facilitate the most effective use of IAEA inspection resources.

117. The IAEA must continue to assume that all the above considerations continue to apply. Such considerations include support for the concept of strengthening safeguards in a way commensurate with maximum technical and cost-effectiveness and efficiency and to ensure also that IAEA safeguards approaches are capable of adequately dealing with facilities coming under safeguards.

118. It is against this background that measures undertaken since 1990 to strengthen safeguards and measures now in prospect should be seen and evaluated. Paragraphs 28 - 33 cover safeguards strengthening measures already endorsed by the Agency's Board of Governors. They also refer to additional ideas and proposals being considered. These are described below. They relate and add to major areas of reform i.e. strengthening the Agency's access to information and to sites and further streamlining and rationalizing its administrative procedures.

A. The Agency's Safeguards Development Programme

119. The process of strengthening safeguards has been underway for some time and is a continuing one. The process received considerable impetus from the recommendations submitted to the Director General, in April 1993, by the Standing Advisory Group on Safeguards Implementation (SAGSI). With the Board of Governors' support, the Agency Secretariat developed "Programme 93+2," a programme for assessment, development and testing of SAGSI's recommendations and other potential measures for strengthening and improving the cost-effectiveness of safeguards. The programme investigates the technical, legal and financial implications of the measures and is predicated on the high level of interaction and cooperation between States and the Agency which is necessary for effective safeguards.

120. The measures considered in the programme are broad in scope and diverse in nature, dealing with both declared and undeclared nuclear activities. They include possible new measures, such as environmental monitoring, for enhancing the Agency's ability to detect undeclared nuclear activities; increased access to information and to sites; further efficiencies in the application of current safeguards activities, including streamlining and rationalizing existing administrative procedures; and possibilities for replacing some current

safeguards procedures by alternative procedures which maintain effectiveness but require less effort and lower cost. Field trials of the measures, in close cooperation with Member States, are a key feature of the programme.

121. The programme includes an assessment of the costs of current safeguards as a function of the magnitude of parameters such as timeliness goals and significant quantities. This assessment involves costs for travel, destructive and non-destructive analyses (DA and NDA), seals and surveillance (C/S), physical inventory verification, records audit and design information verification. Cost estimates, together with technical performance information, will provide the basis for (1) identifying measures which will improve the efficiency of safeguards and (2) determining the cost-effectiveness of measures for strengthening safeguards.

122. A closely linked task in the programme is identifying and evaluating technical and administrative measures having the potential to reduce costs of current safeguards while maintaining effectiveness. The measures include transmission of C/S and NDA data from unattended equipment by mail (by the State or operator) or via satellite. Preliminary cost savings (primarily from reduced inspector travel) have been estimated for these measures. Other measures being examined are the sharing of operators' equipment and of States' analytical services; increased use of the zone approach, of dual C/S and of near-real-time accounting and new and enlarged regional offices.

123. A major element of the programme is assessment of the practicality, effectiveness and costs of environmental monitoring techniques for enhancing the Agency's capability for detecting undeclared nuclear activities. Field trials, carried out so far in nine countries, have tested sampling of water, sediment, biota, vegetation and swipes (particles). The field trials around nuclear reactors have detected their operation at distances up to 50 km. Field trials involving reprocessing and enrichment facilities are being evaluated.

124. Another key task, also with heavy emphasis on field trials, is investigating other measures for enhancing the Agency's capabilities to detect undeclared nuclear activities through increased access to information and to sites. This involves expanded declarations by the State of its nuclear and nuclear-related activities, forms of broader access to additional locations at safeguarded facilities and to other sites, and increased cooperation with the State System of Accounting and Control (SSAC). The contributions of all of these measures to safeguarding declared nuclear material and the possibilities of their replacing some current safeguards activities are also being investigated.

125. Critical to the success of all of these measures for strengthening safeguards is an enhanced capability to manage, analyze and, especially, evaluate the increased data becoming available to the Agency. This increased data includes not only the information from environmental monitoring, expanded declarations and increased access, but also information from the new export-import reporting scheme endorsed by the Board in 1993 and the voluminous information available in open sources, e.g., the press and trade journals. A computer system is being developed to assist in analyzing the information for consistency with each State's declared nuclear activities. The role of inspector and Agency judgment will become even more critical as the amount and diversity of information increase.

126. The programme also includes identification of the training requirements to ensure that Agency staff have the necessary skills to field test and to carry out the new measures.

127. All elements of the programme are well under way and are being accompanied by in-depth consideration of the legal and financial implications. All of the measures being investigated in Programme 93+2 have the potential for becoming part of safeguards in the future. The Secretariat's report to the Board of Governors for its March 1995 meeting will contain proposals resulting from the programme. This current document will be revised to reflect these proposals as they are developed. Work on parts of the programme are expected to continue through 1995. In the final analysis, the Agency's ability to match up to the expectations placed on its safeguards system will depend on the extent to which States, on whose behalf it works, are prepared to grant the necessary authority, resources and political support.

B. Action by the State Parties

128. Recognizing the emphasis placed by the NPT Review Conferences on the need for certain actions to be taken by NPT States to facilitate safeguards implementation by the IAEA, an assessment of some of these actions is presented in the following subsections. Other aspects have already been covered in Subsection B, 'Resources' of Section VI.

1. Member State Support Programmes for IAEA Safeguards

129. An area of actions by States, which has resulted from their recognition of the need for the IAEA to be provided with the necessary financial and human resources, is the establishment of Member State Support Programmes for IAEA safeguards.

130. This support by Member States, outside the regular IAEA budget, has gained increasing importance in enabling the IAEA to

meet its obligations under safeguards agreements. The areas where this extra support has been of primary importance are equipment development and training. The IAEA does not carry out its own research and development programme in safeguards; rather it defines its needs (through a biannual research and development programme and Implementation Support Programme), solicits Member State assistance (mostly through formal Member State programmes in support of IAEA safeguards), and oversees progress in development work.

131. Substantial contributions to the safeguards development needs of the IAEA are made through these national support programmes, which have increased over the past decade and now number 16: Argentina, Australia, Belgium, Canada, Finland, France, Germany, Hungary, Indonesia, Japan, the Netherlands, Russia, Sweden, the United Kingdom, the United States and EURATOM. In addition, a number of States contribute through research and development agreements, contracts and test programmes. While the financial resources employed by Member States in these activities are difficult to assess, they are estimated to represent on the order of $15 million per year currently, thus representing approximately 20 percent of the total resources dedicated to IAEA safeguards.

132. Member States have been asked to assist the IAEA with the development programme on strengthening the effectiveness and improving the efficiency of IAEA safeguards, "Programme 93+2". Many States have responded and are making important contributions, through hosting field trials, performing sample analyses, and providing cost free experts. Without this help, the IAEA would not have been able to accomplish what it has in such a short time.

2. What States can do to facilitate Safeguards Implementation

133. Over and above ensuring adequate technical and financial support for the IAEA's safeguards system, there are a number of other measures which, if implemented by States, would be of considerable practical value. Many of these approaches could be incorporated into the Agency's safeguards system without any need to modify existing safeguards agreements. Some pertinent ones are set out below.

3. Designation of Inspectors

134. The 1985 Final Declaration called upon States to exercise their rights regarding IAEA inspection designation proposals in such a way as to facilitate the most effective use of safeguards manpower.

135. The way in which Member States exercise these rights has an important impact on the efficiency of IAEA safeguards. Many States have cooperated in this respect from the beginning. Some States continue to impose restrictions on the acceptance of inspector designation proposals made to them by the IAEA. Quotas for inspector designations, insistence on reciprocity, unwillingness to accept inspectors of certain nationalities, and significant delays in responding to designation proposals are chronic and continuing problems. The situation has gradually improved. At present, only a few States restrict the number of inspectors, and the number of States taking a long time to respond has been decreasing. In recent years, these difficulties have affected efficient implementation of safeguards in only a few States. Nonetheless, this remains a high priority problem.

136. Under present safeguards agreements, each Agency staff member approved by the Board for use as an inspector must also be accepted individually by the countries to be inspected. Following the Director General's proposal to the Board in February 1988, simplified designation procedures have been introduced in keeping with which States can opt to waive their right to approve individual inspector designations for their own territories and regard the Board's approval of a staff member for inclusion in the corps of inspectors as sufficient. Twenty-three States have accepted the simplified designation procedures or the refinements since made to them, but many States have not.

137. It could substantially enhance the effectiveness and efficiency of the Agency's inspection activities if Member States were automatically to accept all staff members approved by the Board of Governors for use in inspection activities. In accordance with this proposal the Board's decision to approve new inspectors would be communicated, together with the curricula vitae of those inspectors, to all States accepting such a procedure. The inspectors approved by the Board would be considered to be individually acceptable to those States and would be automatically designated unless rejection were received by the Agency within two months. A State's acceptance of this procedure would in no way preclude the State from making specific exceptions at any time later.

4. Visas

138. The use of inspector effort is hampered by restrictions placed by States on the entry of designated inspectors. This is a high priority problem. The basis on which individual States issue visas to Agency inspectors varies substantially. Whereas some States are prepared to grant inspectors multiple-entry visas of limited duration, others insist on single entry visas. In some circumstances, visas are granted on a "special case"

basis. Benefits would derive were Member States automatically to waive the visa requirement on the UN Laissez Passer or to grant inspectors multiple-entry visas. Short notice or no notice inspections which are among the key elements of any strengthened safeguards regime cannot be carried out when restrictive visa requirements are in place. The Agency would also find it easier to deploy its manpower resources more cost effectively and potential costly delays could be avoided.

5. Logistical and other support

139. Nuclear safeguards agreements prescribe the services and facilities which an inspected State must provide or arrange for IAEA inspection teams. Several improvements could be made in this regard. It would thus contribute significantly to the timely and efficient discharge of an inspection team's work if States were to agree to inspectors using independent means of communication, e.g. satellite telephones, and also if they wish their own transportation.

6. Privileges and Immunities

140. The 1959 Agreement on the Privileges and Immunities of the IAEA sets out the Privileges and Immunities of Agency officials while on inspection. The immunities provided under this Agreement are functional rather than full diplomatic immunity. Expanding the scope of immunity accorded to Agency officials while on inspection could provide an additional assurance which could facilitate the discharge of their functions.

141. Features such as those described above are included in the verification arrangements foreseen for the Convention for the Prohibition of Development, Production, Stockpiling and Use of Chemical Weapons and their Destruction (CWC) adopted by the United Nations General Assembly in November 1992. There would appear to be no prima facie reason why such features could not be incorporated into the Agency's inspection activity, thereby making a significant contribution to its effectiveness and efficiency.

Conclusion

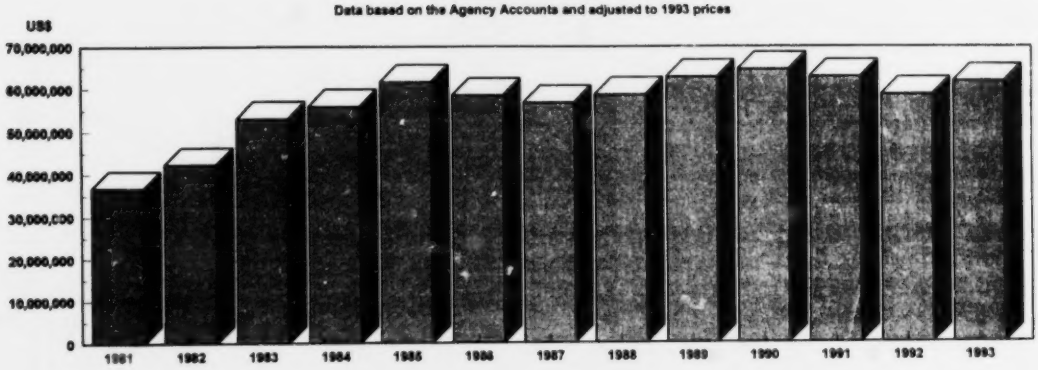
142. IAEA safeguards practices, procedures and implementation have evolved progressively, especially since 1970 when the NPT entered into force. Such evolution derives from a mix of political factors and technological developments.

143. The post-Gulf War discoveries of clandestine enrichment and nuclear weapons programmes in Iraq were a turning point. Efforts are being made to strengthen the IAEA's ability to

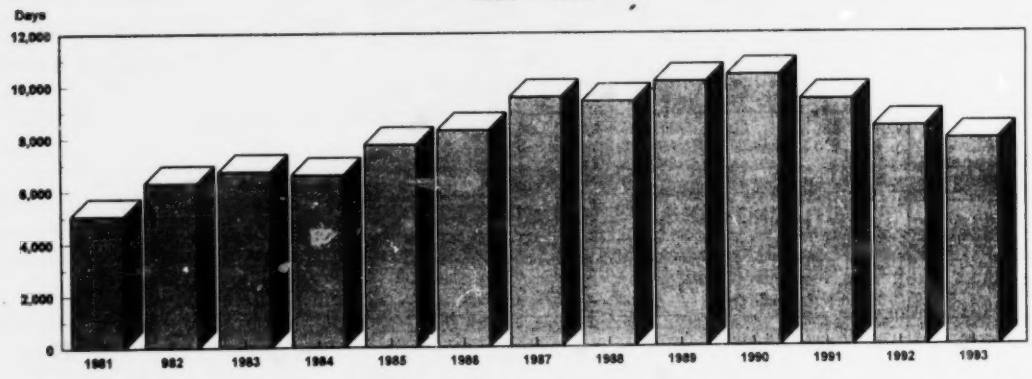
detect the existence of any undeclared nuclear material and facilities.

144. Significant steps have already been taken in this regard. However, much remains to be accomplished. The ultimate success of the collective efforts will depend, above all else, on the extent to which States Party to the NPT are prepared to grant the IAEA the requisite authority, cooperation and resources.

EXPENDITURE
1981 - 1993
Data based on the Agency Accounts and adjusted to 1993 prices



PERSON DAYS OF INSPECTION (PDI)
1981 - 1993



% OF FACILITIES (with more than 1 SQ) AT WHICH GOAL WAS ATTAINED
1981 - 1993

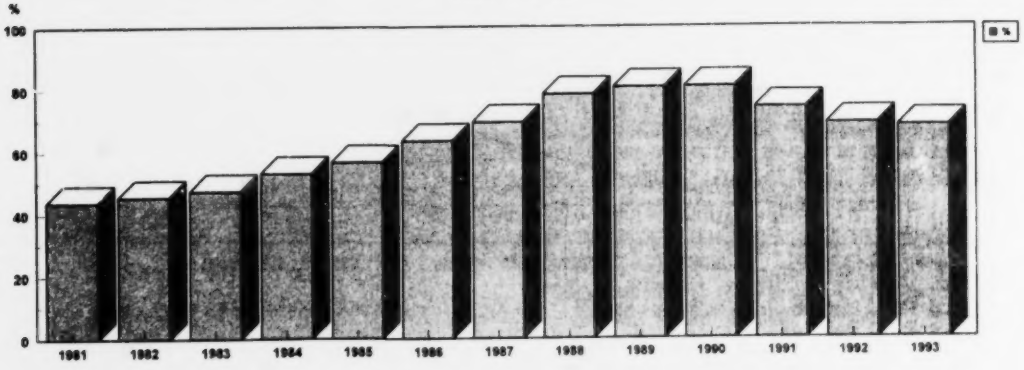
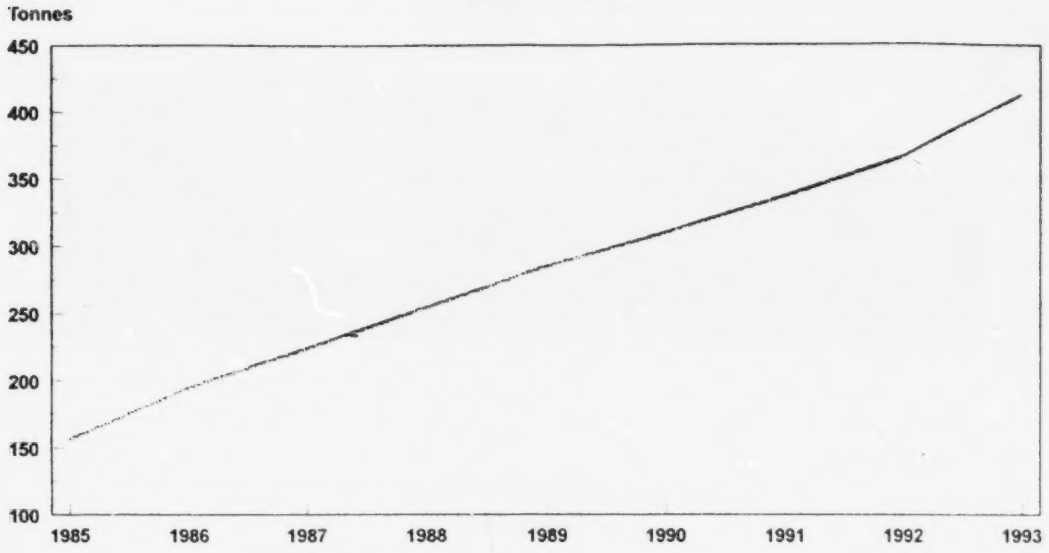


Figure 1

Department
of Safeguards

Irradiated Plutonium
1985 - 1993



Unirradiated Plutonium outside Reactor Cores
1985 - 1993

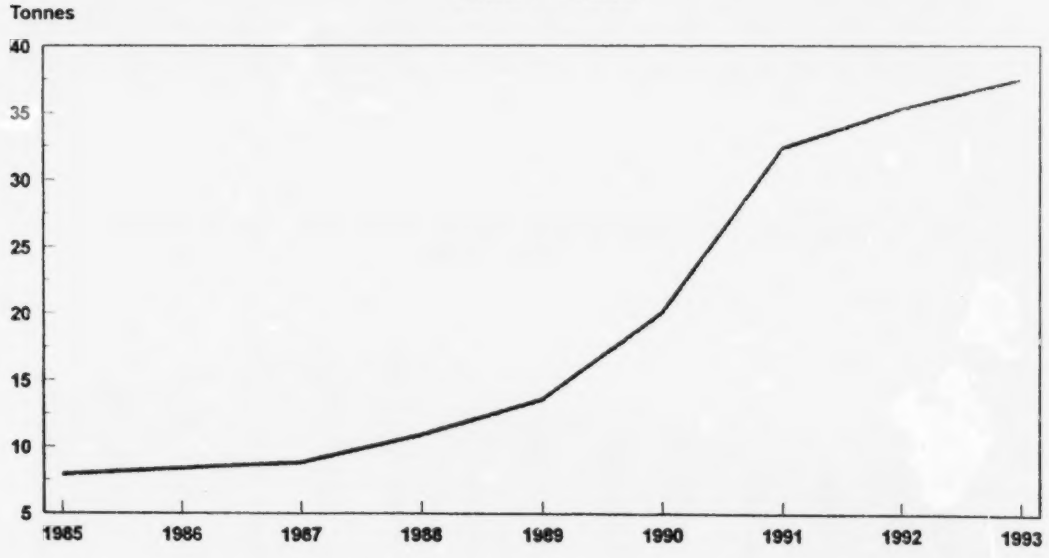


Figure 2

Department of Safeguards

Annex 1

Growth in the number of States having safeguards agreements in force with the Agency

	1975	1980	1985	1990	1994
Total number of States with safeguards agreement in force	64	86	96	104	117
Total number of States with NPT safeguards agreement in force *	46	69	78	86	101
Total number of safeguards agreements in force	106	139	163	177	196
Total number of NPT safeguards agreements in force *	46	65	74	81	93

* The number of NPT safeguards agreements in force differs from the number of States having NPT safeguards agreements in force because in some cases one agreement can apply to more than one State (e.g. EURATOM agreement). Details can be found in Annex 2.

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Situation with respect to the conclusion of safeguards agreements between the Agency and non-nuclear-weapon States in connection with NPT

Status as at 1 July 1994

NNWS which have signed, ratified, acceded to or succeeded to NPT [a] (1)	Date of ratification, accession or succession [a] (2)	Safeguards agreement with the Agency (3)	INFCIRC (4)
Afghanistan	4 February 1970	In force: 20 February 1978	257
Albania	12 September 1990		
Antigua and Barbuda [b]	1 November 1981	Signed: 1 February 1990	...
Armenia	15 July 1993	In force: 6 May 1994	...
Australia	23 January 1973	In force: 10 July 1974	217
Austria	27 June 1969	In force: 23 July 1972	156
Azerbaijan	22 September 1992		
Bahamas	10 July 1973		
Bahrain	3 November 1988		
Bangladesh	27 September 1979	In force: 11 June 1982	301
Barbados	21 February 1980		
Belarus	22 July 1993		
Belgium	2 May 1975	In force: 21 February 1977	193
Belize	9 August 1985	Signed : 13 August 1992	...
Benin	31 October 1972		
Bhutan	23 May 1985	In force: 24 October 1989	371
Bolivia [b]	26 May 1970	Signed: 23 August 1974	...
Botswana	28 April 1969		
Brunei Darussalam	25 March 1985	In force: 4 November 1987	365
Bulgaria	5 September 1969	In force: 29 February 1972	178
Burkina Faso	3 March 1970		
Burundi	19 March 1971		
Cambodia	2 June 1972		
Cameroon	8 January 1969	Signed: 21 May 1992	...
Canada	8 January 1969	In force: 21 February 1972	164
Cape Verde	24 October 1979		
Central African Republic	25 October 1970		
Chad	10 March 1971		
Colombia	8 April 1986		
Congo	23 October 1978		
Costa Rica [b]	3 March 1970	In force: 22 November 1979	278
Côte d'Ivoire	6 March 1973	In force: 8 September 1983	309
Croatia [c]	29 June 1992	Approved: 8 June 1994	...
Cyprus	10 February 1970	In force: 26 January 1973	189
Czech Republic [d]	1 January 1993	In force: 3 March 1972	173
Dem.People's Rep. of Korea	12 December 1985	In force: 10 April 1992	403
Denmark [e]	3 January 1969	In force: 21 February 1977	193
Dominica	10 August 1984		
Dominican Republic [b]	24 July 1971	In force: 11 October 1973	201
Ecuador [b]	7 March 1969	In force: 10 March 1975	231

(1)	(2)	(3)	(4)
Egypt	26 February 1981	In force: 30 June 1982	302
El Salvador [b]	11 July 1972	In force: 22 April 1975	232
Equatorial Guinea	1 November 1984	Approved: 13 June 1986	...
Estonia	31 January 1992	Approved: 24 February 1992	...
Ethiopia	5 February 1970	In force: 2 December 1977	261
Fiji	14 July 1972	In force: 22 March 1973	192
Finland	5 February 1969	In force: 9 February 1972	155
Gabon	19 February 1974	Signed: 3 December 1979	...
Gambia	12 May 1975	In force: 8 August 1978	277
Georgia	7 March 1994		
Germany [f]	2 May 1975	In force: 21 February 1977	193
Ghana	5 May 1970	In force: 17 February 1975	226
Greece [g]	11 March 1970	Accession: 17 December 1981	193
Grenada	19 August 1974		
Guatemala [b]	22 September 1970	In force: 1 February 1982	299
Guinea	29 April 1985		
Guinea-Bissau	20 August 1976		
Guyana	19 October 1993		
Haiti [b]	2 June 1970	Signed: 6 January 1975	...
Holy See	25 February 1971	In force: 1 August 1972	187
Honduras [b]	16 May 1973	In force: 18 April 1975	235
Hungary	27 May 1969	In force: 30 March 1972	174
Iceland	18 July 1969	In force: 16 October 1974	215
Indonesia	12 July 1979	In force: 14 July 1980	283
Iran, Islamic Republic of	2 February 1970	In force: 15 May 1974	214
Iraq	29 October 1969	In force: 29 February 1972	172
Ireland	1 July 1968	In force: 21 February 1977	193
Italy	2 May 1975	In force: 21 February 1977	193
Jamaica [b]	5 March 1970	In force: 6 November 1978	265
Japan	8 June 1976	In force: 2 December 1977	255
Jordan	11 February 1970	In force: 21 February 1978	258
Kazakhstan	14 February 1994	Signed: 26 July 1994	...
Kenya	11 June 1970		
Kiribati	18 April 1985	In force: 19 December 1990	390
Korea, Republic of	23 April 1975	In force: 14 November 1975	236
Kuwait	17 November 1989		
Lao People's Dem. Republic	20 February 1970	Signed: 22 November 1991	...
Latvia	31 January 1992	In force: 21 December 1993	434
Lebanon	15 July 1970	In force: 5 March 1973	191
Lesotho	20 May 1970	In force: 12 June 1973	199
Liberia	5 March 1970		
Libyan Arab Jamahiriya	26 May 1975	In force: 8 July 1980	282
Liechtenstein	20 April 1978	In force: 4 October 1979	275
Lithuania	23 September 1991	In force: 15 October 1992	413
Luxembourg	2 May 1975	In force: 21 February 1977	193

(1)	(2)	(3)	(4)
Madagascar	8 October 1970	In force: 14 June 1973	200
Malawi	18 February 1986	In force: 3 August 1992	409
Malaysia	5 March 1970	In force: 29 February 1972	182
Maldives	7 April 1970	In force: 2 October 1977	253
Mali	10 February 1970		
Malta	6 February 1970	In force: 13 November 1990	387
Mauritania	26 October 1993		
Mauritius	25 April 1969	In force: 31 January 1973	190
Mexico [b]	21 January 1969	In force: 14 September 1973	197
Mongolia	14 May 1969	In force: 5 September 1972	188
Morocco	27 November 1970	In force: 18 February 1975	228
Mozambique	4 September 1990		
Myanmar	2 December 1992		
Namibia	2 October 1992		
Nauru	7 June 1982	In force: 13 April 1984	317
Nepal	5 January 1970	In force: 22 June 1972	186
Netherlands [h]	2 May 1975	In force: 21 February 1977	193
New Zealand	10 September 1969	In force: 29 February 1972	185
Nicaragua [b]	6 March 1973	In force: 29 December 1976	246
Niger	9 October 1992		
Nigeria	27 September 1968	In force: 29 February 1988	358
Norway	5 February 1969	In force: 1 March 1972	177
Panama	13 January 1977	Signed: 22 December 1988	...
Papua New Guinea	25 January 1982	In force: 13 October 1983	312
Paraguay [b]	4 February 1970	In force: 20 March 1979	279
Peru [b]	3 March 1970	In force: 1 August 1979	273
Philippines	5 October 1972	In force: 16 October 1974	216
Poland	12 June 1969	In force: 11 October 1972	179
Portugal [i]	15 December 1977	Accession: 1 July 1986	193
Qatar	3 April 1989		
Romania	4 February 1970	In force: 27 October 1972	180
Rwanda	20 May 1975		
St. Kitts and Nevis	22 March 1993		
St.Lucia	28 December 1979	In force: 2 February 1990	379
St.Vincent & the Grenadines	6 November 1984	In force: 8 January 1992	400
Samoa	17 March 1975	In force: 22 January 1979	268
San Marino	10 August 1970	Approved: 23 February 1977	...
Sao Tome & Principe	20 July 1983		
Saudi Arabia	3 October 1988		
Senegal	17 December 1970	In force: 14 January 1980	276
Seychelles	12 March 1985		
Sierra Leone	26 February 1975	Signed: 10 November 1977	...
Singapore	10 March 1976	In force: 18 October 1977	259
Slovak Republic [j]	1 January 1993	In force: 3 March 1972	173
Slovenia [k]	7 April 1992	Approved: 8 June 1994	...

(1)	(2)	(3)	(4)
Solomon Islands	17 June 1981	In force: 17 June 1993	420
Somalia	5 March 1970		
South Africa	10 July 1991	In force: 16 September 1991	394
Spain	5 November 1987	Accession: 5 April 1989	193
Sri Lanka	5 March 1979	In force: 6 August 1984	320
Sudan	31 October 1973	In force: 7 January 1977	245
Suriname [b]	30 June 1976	In force: 2 February 1979	269
Swaziland	11 December 1969	In force: 28 July 1975	227
Sweden	9 January 1970	In force: 14 April 1975	234
Switzerland	9 March 1977	In force: 6 September 1978	264
Syrian Arab Republic	24 September 1969	In force: 18 May 1992	407
Thailand	7 December 1972	In force: 16 May 1974	241
Togo	26 February 1970	Signed: 29 November 1990	...
Tonga	7 July 1971	In force: 18 November 1993	426
Trinidad and Tobago [b]	30 October 1986	In force: 4 November 1992	414
Tunisia	26 February 1970	In force: 13 March 1990	381
Turkey	17 April 1980	In force: 1 September 1981	295
Tuvalu	19 January 1979	In force: 15 March 1991	391
Uganda	20 October 1982		
United Repulic of Tanzania	7 June 1991	Signed: 26 August 1992	...
Uruguay [b]	31 August 1970	In force: 17 September 1976	157
Uzbekistan	7 May 1992	Approved: 21 February 1994	...
Venezuela [b]	26 September 1975	In force: 11 March 1982	300
Viet Nam	14 June 1982	In force: 23 February 1990	376
Yemen, Republic of	1 June 1979		
Yugoslavia(Serbia and Montenegro)Federal Republic of [c]	3 March 1970	In force: 2[c] December 1973	204
Zaire	4 August 1970	In force: 9 November 1972	183
Zambia	15 May 1991	Approved: 8 June 1994	...
Zimbabwe	26 September 1991		

[a] The information reproduced in columns (1) and (2) was provided to the Agency by depositary Governments of NPT, and an entry in column (1) does not imply the expression of any opinion on the part of the Secretariat concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of its frontiers. The Table does not contain information relating to the participation of Taiwan, China in NPT.

[b] The relevant safeguards agreement refers to both NPT and the Tlatelolco Treaty.

[c] The NPT safeguards agreement concluded with the Socialist Federal Republic of Yugoslavia (INFCIRC/204), which entered into force on 28 December 1973, continues to be applied in Croatia to the extent relevant to the territory of Croatia.

[d] The NPT safeguards agreement concluded with the Czechoslovak Socialist Republic (INFCIRC/173), which entered into force on 3 March 1972, continues to be applied in the Czech Republic to the extent relevant to the territory of the Czech Republic.

[e] The NPT safeguards agreement with Denmark (INFCIRC/176), in force since 1 March 1972, has been replaced by the agreement of 5 April 1973 between the non-nuclear-weapon States of EURATOM, EURATOM and the Agency (INFCIRC/193) but still applies to the Faroe Islands. Upon Greenland's secession from EURATOM as of 31 January 1985, the Agreement between the Agency and Denmark (INFCIRC/176) re-entered into force for Greenland.

[f] The safeguards agreement of 7 March 1972 concluded with the German Democratic Republic (INFCIRC/181) is no longer in force with effect from 3 October 1990 on which date the German Democratic Republic acceded to the Federal Republic of Germany.

[g] The application of Agency safeguards in Greece under the agreement INFCIRC/166, provisionally in force since 1 March 1972, was suspended on 17 December 1981, at which date Greece acceded to the agreement of 5 April 1973 (INFCIRC/193) between the non-nuclear-weapon States of EURATOM, EURATOM and the Agency.

[h] An agreement had also been concluded in respect of the Netherlands Antilles (INFCIRC/229). This agreement entered into force on 5 June 1975.

[i] The NPT safeguards agreement with Portugal (INFCIRC/272), in force since 14 June 1979, was suspended on 1 July 1986, on which date Portugal acceded to the agreement between the non-nuclear-weapon States of EURATOM, EURATOM and the Agency of 5 April 1973 (INFCIRC/193).

[j] The NPT safeguards agreement concluded with the Czechoslovak Socialist Republic (INFCIRC/173), which entered into force on 3 March 1972, continues to be applied in the Slovak Republic to the extent relevant to the territory of the Slovak Republic.

[k] The NPT safeguards agreement concluded with the Socialist Federal Republic of Yugoslavia (INFCIRC/204), which entered into force on 28 December 1973, continues to be applied in Slovenia to the extent relevant to the territory of Slovenia.

[l] The NPT safeguards agreement concluded with the Socialist Federal Republic of Yugoslavia (INFCIRC/204), which entered into force on 28 December 1973, continues to be applied in the Federal Republic of Yugoslavia (Serbia and Montenegro) to the extent relevant to the territory of the Federal Republic of Yugoslavia (Serbia and Montenegro).

Annex 3

States which have not concluded the required safeguards agreement with the Agency in connection with NPT

Status as at 1 July 1994

Non-nuclear-weapon States party to NPT without safeguards agreement in force [a] (1)	Date of ratification, accession or succession to NPT (2)	Status of negotiation (3)	Date agreement should enter into force (4)
Albania [b]	12 September 1990		12 March 1992
Antigua and Barbuda [c]	1 November 1981	Signed 1 February 1990	1 May 1983
Azerbaijan	22 September 1992		22 March 1994
Bahamas	10 July 1973		10 January 1975
Bahrain	3 November 1988		3 May 1990
Barbados	21 February 1980		21 August 1981
Belarus	22 July 1993		22 January 1995
Belize	9 August 1985	Signed 13 August 1992	9 February 1987
Benin	31 October 1972		30 April 1974
Bolivia [c]	26 May 1970	Signed 23 August 1974	5 March 1972
Botswana	28 April 1969		5 March 1972
Burkina Faso	3 March 1970		5 March 1972
Burundi	19 March 1971		19 September 1972
Cambodia	2 June 1972		2 December 1973
Cameroon	8 January 1969	Signed 21 May 1992	5 March 1972
Cape Verde	24 October 1979		24 April 1981
Central African Republic	25 October 1970		25 April 1972
Chad	10 March 1971		10 September 1972
Colombia [d]	8 April 1986		8 October 1987
Congo	23 October 1978		23 April 1980
Dominica	10 August 1984		10 February 1986
Equatorial Guinea	1 November 1984	Approved 13 June 1986	1 May 1986
Estonia	31 January 1992	Approved 24 February 1992	31 July 1993
Gabon	19 February 1974	Signed 3 December 1979	19 August 1975
Georgia	7 March 1994		7 September 1995
Grenada	19 August 1974		19 February 1976
Guinea	29 April 1985		29 October 1986
Guinea-Bissau	20 August 1976		20 February 1978
Guyana	19 October 1993		19 April 1995
Haiti [c]	2 June 1970	Signed 6 January 1975	2 June 1972
Kenya	11 June 1970		11 June 1972
Kuwait	17 November 1989		17 May 1991
Lao People's Democratic Rep.	20 February 1970	Signed 22 November 1991	5 March 1972
Liberia	5 March 1970		5 March 1972

(1)	(2)	(3)	(4)
Mali	10 February 1970		5 March 1972
Mauritania	26 October 1993		26 April 1995
Mozambique	4 September 1990		4 March 1992
Myanmar	2 December 1992		2 June 1994
Namibia	2 October 1992		7 April 1994
Niger	9 October 1992		9 April 1994
Panama [c, d]	13 January 1977	Signed 22 December 1988	13 July 1978
Qatar	3 April 1989		3 October 1990
Rwanda	20 May 1975		20 November 1976
St. Kitts and Nevis	22 March 1993		22 September 1994
San Marino	10 August 1970	Approved 23 February 1977	5 March 1972
Sao Tome and Principe	20 July 1983		20 January 1985
Saudi Arabia	3 October 1988		3 April 1990
Seychelles	12 March 1985		12 September 1986
Sierra Leone	26 February 1975	Signed 10 November 1977	26 August 1976
Somalia	5 March 1970		5 March 1972
Togo	26 February 1970	Signed 29 November 1990	5 March 1972
Uganda	20 October 1982		20 April 1984
United Republic of Tanzania	7 June 1991	Signed 26 August 1992	7 December 1992
Uzbekistan	7 May 1992	Approved 21 February 1994	7 November 1993
Yemen, Republic of	1 June 1979		1 December 1980
Zambia	15 May 1991	Approved 8 June 1994	15 November 1992
Zimbabwe	26 September 1991		26 March 1993

[a] The information reproduced in columns (1) and (2) was provided to the Agency by the depository Governments of NPT, and an entry in column (1) does not imply the expression of any opinion on the part of the Secretariat concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of its frontiers. The Table does not contain information relating to the participation of Taiwan, China, in the NPT.

[b] A comprehensive safeguards agreement not in connection with the NPT is in force with this State.

[c] The relevant safeguards agreement refers to both the NPT and the Treaty of Tlatelolco.

[d] A comprehensive safeguards agreement pursuant to the Treaty of Tlatelolco is in force with this State.

PREPARATORY COMMITTEE FOR THE
1995 CONFERENCE OF THE PARTIES
TO THE TREATY ON THE NON-PROLIFERATION
OF NUCLEAR WEAPONS

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Geneva, 12 - 16 September 1994

ACTIVITIES OF THE INTERNATIONAL ATOMIC ENERGY AGENCY RELEVANT TO ARTICLE IV OF THE TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS

Prepared by the Secretariat of the IAEA for the 1995
Conference of the Parties to the NPT

94-32674

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1. INTRODUCTION

Article IV of the NPT stipulates that,

"1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty.

2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also co-operate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world."

While transfer of technology, in this context, also takes place through bilateral and other multilateral channels, the IAEA serves as the key international mechanism for scientific and technical co-operation in the promotion of the peaceful use of nuclear energy and has played and continues to play an important role in the transfer of nuclear techniques to the developing areas of the world.

According to its Statute, the IAEA has pursued the twin and mutually reinforcing goals of promoting the peaceful benefits of atomic energy and verifying that nuclear materials and facilities placed under its control are used for peaceful purposes.

The IAEA General Conference has on several occasions confirmed its continuing support for an adequate balance between those of the Agency's programmes which aim at making more widely available the benefits of peaceful uses of nuclear energy and those which are designed to ensure that nuclear material is not diverted for military purposes (the safeguards system). The NPT, negotiated more than a decade after the creation of the Agency, reflected the same philosophy and the twin goals have been reconfirmed by successive NPT Review Conferences.

1.1. The Legal Framework

Facilitating the exchange of equipment, material and scientific and technological information for the peaceful uses of nuclear energy, and facilitating co-operation between Member States for this purpose, as envisaged by Article IV of the NPT, are key statutory functions of the IAEA.

Article III of the IAEA's Statute authorizes the Agency, *inter alia*:

- "to encourage and assist research on, and development and practical application of, atomic energy for peaceful uses throughout the world; and, if requested

to do so, to act as intermediary for the purposes of securing the performance of services or the supplying of materials, equipment, or facilities;"

- "to meet the needs of research on, and development and practical application of, atomic energy for peaceful purposes, including the production of electric power, with due consideration for the needs of the under-developed areas of the world;"

- "to foster the exchange of scientific and technical information on peaceful uses of atomic energy;"

- "to encourage the exchange and training of scientists and experts in the field of peaceful uses of atomic energy."

1.2. Mechanisms For Technology Transfer

Implementation of the above objectives and functions is undertaken by the Department of Technical Co-operation and two technical departments, the Department of Research and Isotopes and the Department of Nuclear Energy and Safety. While technology transfer through technical departments forms part of the Agency's Regular Programme and is financed through the Regular Budget, technical assistance provided by the Department of Technical Co-operation is funded largely from voluntary contributions of Member States.

2. TECHNOLOGY TRANSFER THROUGH THE AGENCY'S REGULAR PROGRAMME

The major technology transfer activities carried out under the Regular Programme include information exchange through symposia, seminars, conferences and technical committee meetings, co-ordinated research programmes, publications, support activities and many other activities of interest to Member States. Examples of such activities are given in Sections 2.1 to 2.5.

2.1. International Nuclear Information System (INIS)

INIS continues to be one of the Agency's principal channels for disseminating scientific and technical information. The system covers virtually every aspect of the peaceful uses of nuclear energy. In 1993, the database of the system contained over 1.7 million records and is growing at a rate of almost 90,000 records a year. Over 278,000 documents are stored and can be provided on microfiche.

As can be seen from **Figure 1**, participation in INIS has steadily increased since 1970. At present, this participation corresponds to 65 developing and 21 industrialized Member States as well as 17 international organizations. Most INIS system products are available to developing countries free of charge or at nominal fees.

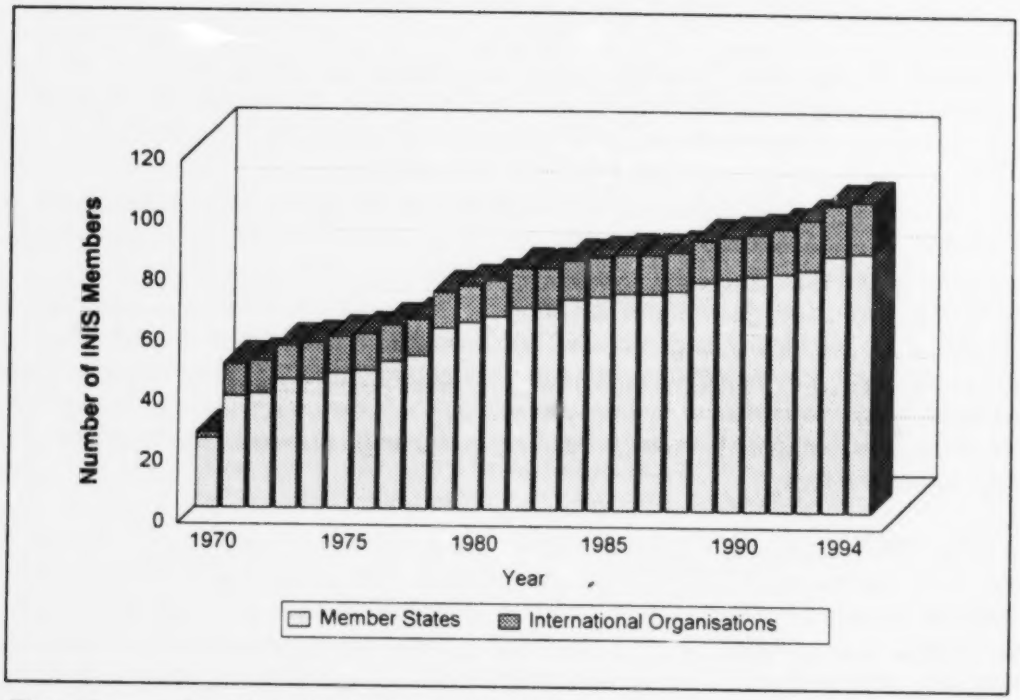

Figure 1 Annual growth of INIS membership since 1970.

2.2. Meetings and Publications

The Agency holds some 400 meetings on various topics in nuclear science and technology annually, including 10-14 major conferences, symposia and seminars, as well as a wide range of advisory group, technical committee and consultants' meetings. Most of these meetings deal with nuclear applications and techniques which are of direct benefit to developing countries and are thus in line with the objectives of technology transfer.

For various reasons, but mainly owing to financial constraints, participation in these meetings of scientists and specialists from developing Member States continues to be relatively low. For the period 1989 - 1993 the annual proportion of participants from developing countries at the Agency's major meetings fluctuated between 28% and 36%. During these five years, the attendance of 649 (28%) of the 2326 participants from developing countries who attended major meetings was funded by the Agency.

Many meetings, projects and programmes of the technical departments result in publications and technical documents which are widely disseminated to Member States. In 1993, developing countries received over 116,000 copies of IAEA publications, including cost free proceedings, technical documents, bulletins, newsbriefs, etc.

2.3. Centres and Laboratories (Seibersdorf, Monaco, Trieste)

Alone among other international organizations, the IAEA operates its own research and service laboratories, which contribute significantly to the transfer of nuclear technology to Member States.

The Agency's laboratories at its Headquarters in Vienna and at **Seibersdorf**, near Vienna, provide directly to Member States a diversity of technical services for programmes in physics, chemistry, hydrology, nuclear instrumentation and agriculture to assist developing countries to solve a variety of problems. The services provided in agriculture cover soil fertility, irrigation and crop production; plant breeding and genetics; animal production and health; insect and pest control; and agrochemicals. Three principal mechanisms are used by the laboratories for transferring selected techniques and technologies to national research institutions: training courses, on-the-job training, and laboratory services.

The IAEA **Marine Environment Laboratory, Monaco,** carries out studies of pollution and radioactivity in the marine environment, collaborating with oceanographic institutes worldwide and undertaking projects in co-operation with other international environmental programmes and institutions combining nuclear and non-nuclear techniques. The Laboratory participates in international experiments, marine pollution assessments and research at the request of Member States. It also conducts training courses and laboratory intercomparison exercises.

The **International Centre for Theoretical Physics (ICTP),** financed jointly by the Italian Government, UNESCO and the Agency, with some additional funds made available by other donors, is an important mechanism for the exchange and transfer of advanced scientific knowledge and skills. The main objectives of the Agency's involvement in these activities are: to foster the growth in developing countries of advanced studies and research in the physical and mathematical sciences, especially at the interface with technology; to provide an international forum for scientists from all countries; and to provide facilities to enable visitors, associates and fellows to conduct original research. The Centre is active in many scientific fields, including fundamental physics, condensed matter physics, mathematics, physics and energy, physics and the environment, physics and the living state, and applied physics and technology.

Over 4500 scientists participated in research and training activities carried out at the Centre in 1993, of which 57% came from developing countries. The Centre has 441 Associate Members and 376 Federated Institutes in developing countries.

The ICTP disseminates a great volume of scientific information. In 1993, it distributed 31,985 journals, 6060 proceedings and 261 books to 400 institutions in 70 developing countries.

The administrative responsibility of the Agency for ICTP will be transferred to UNESCO as soon as the agreements are finally accepted by all parties. But the Agency will still continue to support the Centre technically and financially.

2.4. Research Contract Activities

Through the Research Contract activities, the IAEA unites researchers in developing and industrialized countries in progress toward common research goals. These contracts offer guidance to scientists from the developing world and provide opportunities for scientists in all Member States to communicate freely and exchange information on research activities.

Technology transfer is carried out by placing contracts and agreements with research centres, laboratories, universities and other institutions in Member States to conduct research projects in relation to their scientific programmes. Most of these contracts and agreements are components of **Co-ordinated Research Programmes (CRPs)** — research endeavours planned by the Agency which give groups of scientists the opportunity to co-operate in tackling a common problem. Contracts offered under this programme provide a nominal award, currently averaging about $5000 per annum.

Figure 2 shows the steady growth of Research Contract activities, financed from the Agency's Regular Budget, since the establishment of the NPT. In the **last ten years** the Agency has in this way financed research activities totaling **$39.2 million** from the Regular Budget. During the same period, additional extrabudgetary contributions to the programme totalling $ 46.3 million have also been received from Australia, France, Germany, Italy, Japan, the Netherlands, Sweden and the United States of America.

As an alternative to Research Contracts, which always include financial support, Research Agreements are also concluded with institutes to enable them to participate in the Research Contract Programme. These agreements are similar in nature to the contracts, but do not provide funds to the participating institute.

Research is currently being supported by the Agency under this programme in the broad fields of radioisotope and radiation applications, the protection against ionizing radiation, the conservation of the environment and nuclear fuel cycle technologies. About three quarters of the programme supports research endeavours in applications of nuclear techniques, while a quarter of the activities relate to nuclear power and safety. Research work is currently being carried out under 1900 research contracts and agreements in more than 90 Member States and involves participation in some 150 CRPs.

For the transfer of scientific knowledge, 80 Research Co-ordination Meetings (RCMs) were held in 1993 in respect of 144 on-going Co-ordinated Research Programmes. 117 publications have resulted from the 26 CRPs completed and evaluated in 1993, (30 books and 87 scientific articles).

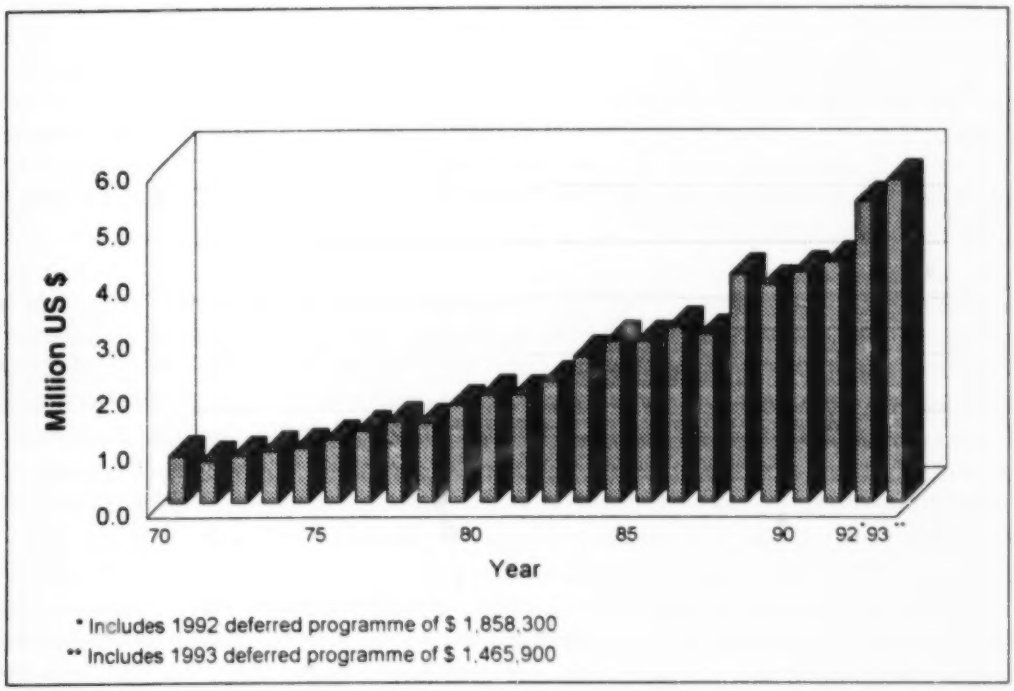

Figure 2 The Research Contract Programme since 1970, financed from the Regular Budget.

2.5. Examples of Activities within The Agency's Regular Programme with a Large Component of Technology Transfer

Examples of activities within the Agency's Regular Programme with a large component of technology transfer can be found in the Agency's Annual Reports. The following examples of such activities in 1993 have been selected to illustrate the IAEA effort and contribution to the transfer of technology.

In **food and agriculture**, the use of isotopic tracers in Co-ordinated Research Programmes have led to increased efficiency of phosphorus uptake by crops and in studying the rate of soil erosion; the use of neutron moisture guages have led to improved water use efficiency in irrigation systems.

A CRP on the radiation induction of mutation in breeding rape seed for oil has led to the release to farmers of three mutant varieties in Bangladesh and China, and in sesame the release of 19 mutant varieties in Egypt and the Republic of Korea. Significant progress has also been made using radiation induced mutations in improving plant architecture and in modifying seed oil quality and content.

Other CRPs completed in agriculture cover a wide variety of livestock species (cattle, sheep, goats, llamas, alpacas, camels and buffaloes) and agroecological zones in Africa, Asia and Latin America. These programmes focused on the use of isotopic methods to define nutritional and reproductive problems for the production of milk, meat and fibre, and on researching ways to overcome constraints in a cost effective manner.

A CRP for Asia and the Pacific, Africa and the Middle East on the **application of isotope and geochemical techniques in geothermal exploration** ended. Institutes from 11 countries carried out investigations in low temperature geothermal areas on the southeast Asia coast (China and Viet Nam) and on the Korean peninsula (Republic of Korea), in medium temperature areas in the Himalayas (India and Pakistan), and in high temperature fields in Iceland, Indonesia, Italy, New Zealand, the Philippines and Turkey. Isotope techniques have helped understand the hydrology of geothermal areas in order to identify the location of the resources and in particular to identify the most suitable sites for drilling the production wells.

In the application of nuclear techniques in the field of **human health,** an interregional seminar was held in Vienna where information was presented on recent advances in the application of radionuclides in the diagnosis and management of disorders of the kidney and the urinary and gastrointestinal tract. Progress was made through a CRP on optimizing radionuclide based molecular techniques for the diagnosis of tuberculosis and blood borne diseases such as hepatitis, Chagas disease, AIDS and malaria.

In the field of **industry, earth sciences and environment**, a symposium was held on the application of isotope techniques in studying past and current environmental changes in the hydrosphere and the atmosphere. The symposium demonstrated that isotopes are among the most powerful tools to investigate past environmental and climatic changes and their causes and that these studies could help to formulate hypotheses and predict changes in the 21st century.

The following examples may be given regarding the Agency's Regular Programme activities in recent years in **nuclear power related areas**.

The Agency convened a meeting in 1993 of international organizations to establish an Inter-Agency project (DECADES) on databases and methodologies for comparative assessment of different energy sources for electricity generation in terms of their impact on environment, health and other relevant parameters. The project is being carried out jointly by nine international organizations (the IAEA, CEC, ESCAP, IBRD, IIASA, OECD/NEA, OPEC, UNIDO and WMO) under the supervision of a Joint Steering Committee of representatives of all the participating organizations. The results will be presented and discussed at a Symposium on Electricity, Health and the Environment, to be held in 1995. This work is also the basis of the Agency's contribution to the activities of the Inter-Governmental Panel on Climate Change (IPCC) and of the United Nations Inter-Agency Committee on Sustainable Development (IACSD).

In 1989, the Agency started activities in nuclear energy for sea water desalination under a plan for producing potable water economically. A report has been prepared containing a review of the most up-to-date of desalination processes and possible coupling schemes with nuclear reactors. At the same time, the IAEA is assisting countries (in particular from North Africa and Saudi Arabia) in feasibility studies on sea water desalination using nuclear energy.

A special report, "Policy Planning for Nuclear Power: An Overview of the Main Issues and Requirements" was published. This document, in non-technical language, reviews political, governmental, economic, financial and technical issues that must be dealt with by a government prior to and during the commitment to a safe, economic and reliable nuclear power programme.

As regards the **nuclear fuel cycle**, recent activities of particular interest to developing countries are:

- Elaboration of documents on uranium exploration and production, including environmental impact assessments.

- Preparation of technical documents on handling, treatment, conditioning and storage of radioactive waste, with emphasis on quality assurance and minimizing waste.

3. TECHNOLOGY TRANSFER THROUGH THE TECHNICAL CO-OPERATION PROGRAMME

The main part of the Agency's technology transfer to Member States is undertaken through its Technical Co-operation Programme (TC Programme), administered by the Department of Technical Co-operation. This consists of projects requested by Member States and approved by the Board of Governors and covers all geographic regions and all aspects of nuclear energy for power and non-power applications. In 1993, the programme comprised more than 1200 projects in over 80 developing countries. Details of this programme are given below.

In view of the size, scope and nature of the assistance provided, the TC Programme has specific conditions for implementation. Thus within the framework established by the statutory provisions referred to in Section 1.1 above, the delivery of the Agency's technical assistance is regulated by "**The Revised Guiding Principles and General Operating Rules to Govern the Provision of Technical Assistance by the International Atomic Energy Agency**", approved by the Board of Governors and issued in 1979 [INFCIRC/267]. The provision of the assistance is further regulated by a supplementary agreement which should be concluded by the Agency and a recipient Member State ("**Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the International Atomic Energy Agency**"). Both documents contain, *inter alia*, provisions concerning exclusively peaceful use of technical assistance provided through the IAEA TC Programme and the Agency's Safety Standards and Measures applied to such assistance.

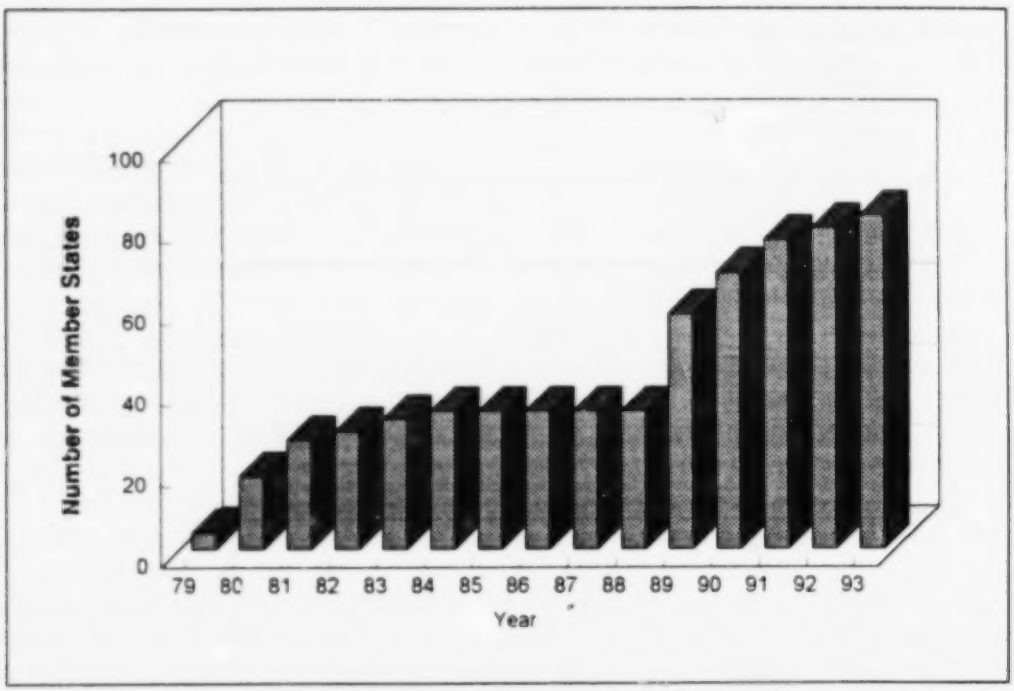

Figure 3 The number of TC recipient Member States having concluded a Revised Supplementary Agreement (RSA), concerning the provision of technical assistance by the IAEA.

Figure 3 shows the number of Member States, recipients of technical assistance in a given year, which have concluded a supplementary agreement with the Agency. The figure shows the success of the effort made since 1988 to bring almost all recipient countries under this agreement. After the break-up of the former Soviet Union and some countries in Central and Eastern Europe, a number of newly independent States joined the Agency during 1992 and 1993. The Agency responded immediately to requests for technical assistance in order to address some of the pressing problems in these countries although they had not yet signed the Agreement.

The TC Programme comprises projects with individual Member States (national projects), regional projects and interregional projects. Many of the regional projects fall within the framework of regional co-operative agreements to which Member States of the region may choose to be party. The interregional projects cover a range of nuclear applications and supporting activities which are of common interest to a large number of developing Member States worldwide, e.g. radiation protection, waste management, programming and implementation of nuclear-related activities, application of nuclear techniques in industry, hydrology and environmental research, in diagnosis and treatment of diseases common to all countries (cancer, heart diseases), as well as in agricultural research, production and processing. These global projects include some 20 training courses annually, together with 10-12 multi-year projects through which specific advice is provided to Member States in all geographical regions.

Assistance is requested by Member States on the basis of their needs and national priorities. All Member States are entitled to receive assistance; however, TC funds "... should be allocated primarily to meet the needs of developing countries ..." [INFCIRC/267].

The delivery of the TC Programme is facilitated by grouping recipient countries administratively (at present) into four regions: Africa, Latin America, Asia and Pacific, and Middle East and Europe. The countries within a region share many common features ranging from a history of intercountry co-operation to priorities in the application of specific nuclear technologies.

Common interests are also supported by co-operation among these countries through regional activities, which permit better use of resources while supporting inter-country co-operation, in particular Technical Co-operation among Developing Countries (TCDC).

3.1. TC Programme Areas

Projects in the TC Programme are grouped into ten categories (programme areas), reflecting the areas of national economy or infrastructure being supported in the Member States. These are: nuclear power; nuclear fuel cycle; radioactive waste management; food and agriculture; human health; industry and earth sciences; physical and chemical sciences; radiation protection; safety of nuclear installations; and direction and support.

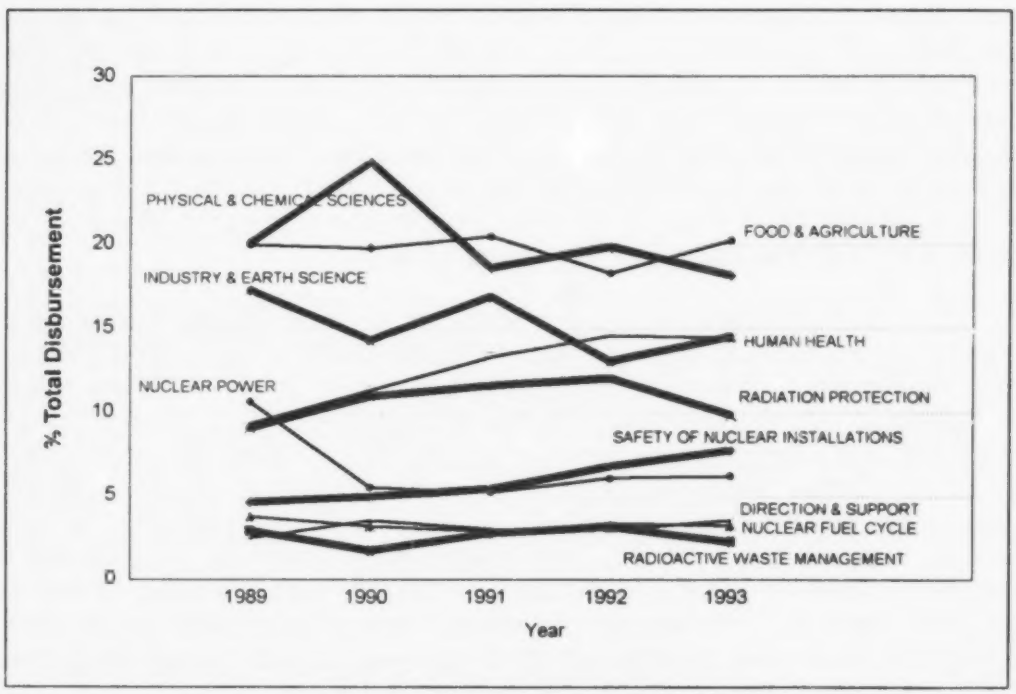

Figure 4 The percentage of total annual disbursements in each of the main programme areas of the IAEA.

Figure 4 shows the proportion of the total annual disbursements in each programme area, over the five-year period from 1989 to 1993, and illustrates the trends and changing directions of the TC Programme. High priority continues to be given to the applications of nuclear techniques in food and agriculture, the physical and chemical sciences and industry, highlighting one of the principal aims of the TC programme: to promote economic and scientific development in Member States. These particular programme areas cover a wide range of development sectors and represents a major part of the total programme. Disbursements in the areas of physical and chemical sciences ranged between 18% and 25%, while industry and earth sciences maintained an average share of about 15%. Recently, the largest portion of the programme has been devoted to food and agriculture, accounting for over 20% of disbursements in 1993. This reflects another vitally important aim which is to seek to improve the health, welfare and the quality of life of Member States' populations, particularly those of Least Developed Countries (LDCs).

For a number of reasons, nuclear power programmes in many countries have been cut back or halted. At the same time there is increased awareness of the needs for nuclear safety and radiation protection and the TC Programme has attempted to reflect the changing priorities by shifting emphasis accordingly. The share of disbursements from the programme on nuclear power has dropped from 12% to 6% since 1989, whereas the proportion allotted to safety and radiation protection measures has been increased. Direction and support activities have been maintained steadily at around 3% to improve the servicing and co-ordination of Technical Co-operation and thereby strengthening the capacity of Member States to absorb the assistance provided.

Another programme area which shows continued increase since 1989 is human health. Indeed the number of requests for assistance in the utilization of nuclear techniques for the diagnosis of many diseases such as leishmaniasis, Chagas disease, iodine deficiency diseases, sickle cell disease and thalassaemia and treatment by radiation therapy shows the high degree of interest and demand.

3.2. Types of Assistance Provided

The assistance available through the TC Programme is provided mainly through three components: experts, equipment and training (fellowships, scientific visits, training courses), that support the establishment or upgrading of nuclear techniques and facilities. A particularly important area is the provision of support to set up or improve regulatory practices and radiation safety infrastructures as a prerequisite for assistance in certain fields of activity.

Since 1970, under the Agency's TC Programme, over 16,000 scientists and specialists from developing Member States have been awarded fellowships or scientific visits, and about 17,000 participants have attended training courses. Almost 28,000 qualified experts have been assigned to assist development in Member States of technical areas where nuclear technology is involved. Related equipment and materials to the value of nearly $270 million have been delivered through technical co-operation projects.

3.3. Funding The TC Programme

Whilst the administrative cost of the technical co-operation projects and the technical support they require is fully borne by the regular budget of the IAEA, the assistance actually provided to the recipient countries is financed solely by voluntary contributions from Member States, made directly to the IAEA or through the United Nations Development Programme (UNDP).

Technical co-operation projects are financed from four separate resources:

- The Technical Assistance and Co-operation Fund (TACF)
- Extrabudgetary contributions
- In-kind contributions
- UNDP funds.

The **TACF** is the mainstay of the TC Programme, accounting for over three quarters of the total resources during the past few years. The bulk of the TACF is derived from voluntary contributions by Member States towards a target resulting from prior consultations. This target, which is now set for three or more years in advance, remained almost stationary during the first decade of the IAEA's existence. Since 1977 it has been increasing, reaching $55.5 million in 1993. Once the target is set, Member States are encouraged to pledge, paying a share of the target which is calculated essentially according to the rates used in the United Nations system for assessed contributions. It must be noted however that not all Member States pledge and pay according to their share (see Annex).

The second major resource is **extrabudgetary** income, made up of cash contributions from Member States in addition to their contributions to the TACF. This money is made available by donor countries to finance specific projects which have been appraised by the IAEA Secretariat as technically sound but which cannot be financed through the TACF owing to insufficient resources, (so called Footnote a/ projects).

A third type of voluntary contribution is '**assistance in kind**', whereby Member States provide expert services, donate equipment, or arrange fellowships, free of charge. Fellowships are of particular value to the TC Programme.

Finally, IAEA acts as executing agency for projects of the UNDP in areas involving nuclear science and technology and receives UNDP funds for the implementation of such projects.

The TACF has grown from modest beginnings of about $4 million in 1970 to a peak of almost $53 million in 1993, as illustrated in **Figure 5**, which shows the respective share of the TACF, extrabudgetary and UNDP resources available for technical co-operation. In terms of the nominal values, a steep increase in the programme until 1989 can be observed. UNDP funds accounted for more than 40% of available resources in 1975, but have dropped continuously since 1979 to about 2%. Extrabudgetary and in-kind resources combined have fluctuated between 10% and 30% in any given year since 1970.

Figure 6 shows the same information, now corrected for inflation. It can be seen that the increase of programmable resources in real terms is not as marked as implied when using nominal values. The decrease in UNDP activities since 1980 is also clearly visible. The sharp drop, both in nominal and real terms, in 1992 was due to the devaluation of the currency held by the Agency of a major donor country.

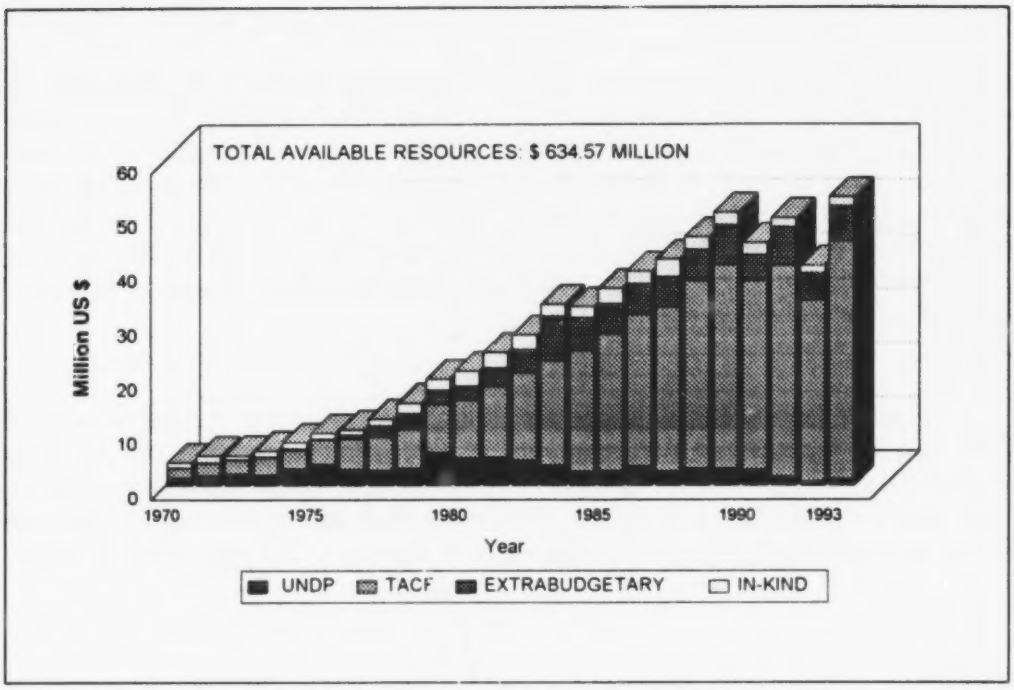

Figure 5 TC resources available by year and by source of funding.

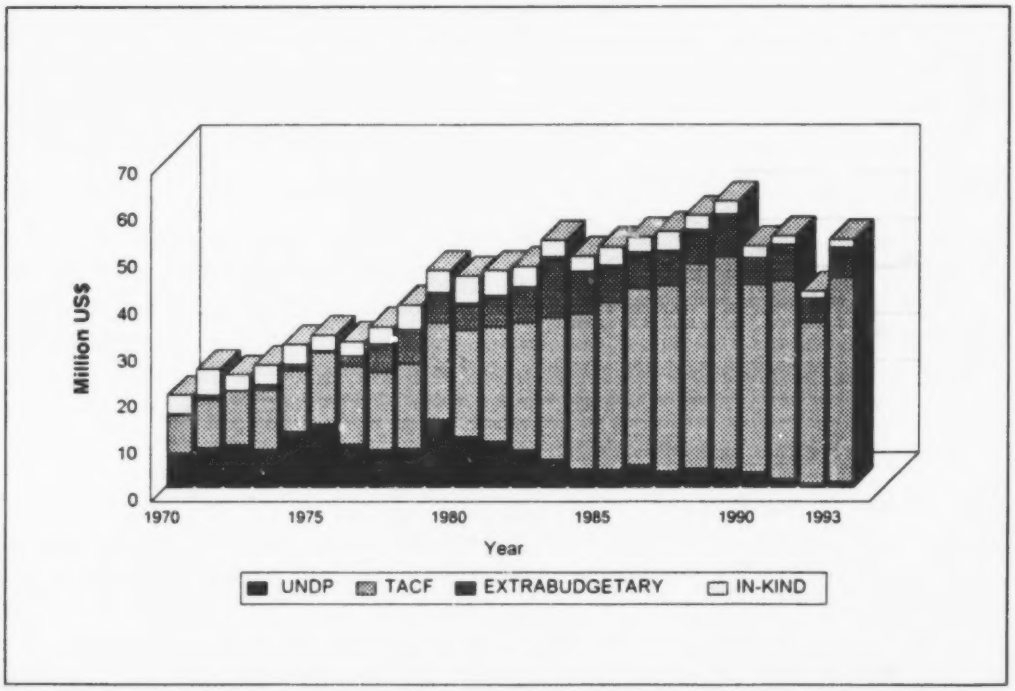

Figure 6 TC resources available by year and by source of funding, corrected for inflation using average annual OECD rates.

3.4. Technical Co-operation and NPT

In the preparation of the TC Programme, the Agency does not differentiate between NPT or non-NPT Member States. Projects are assessed exclusively in terms of technical and practical feasibility, national development priorities and long term advantages to end-users. This selection process is in accordance with the conditions for participating in the TC Programme as set out in INFCIRC/267.

What are the consequences of this policy? **Figure 7** to **Figure 9** shows the results of a survey undertaken for TC and Research Contract activities. **Figure 7** shows the disbursements from the TACF to Member States according to NPT status for each year since 1984. The proportion of disbursements from the TACF to non-NPT Member States has remained relatively constant, fluctuating between 16% and 20%.

The situation for extrabudgetary funding is quite different. As already stated, the value of projects approved for funding exceeds the resources available through TACF. Member States are then notified of the remaining projects as candidates for extrabudgetary support. The donor countries are free to choose the projects they are prepared to finance. Here, a clear preference is shown by donors for those in Member States party to NPT. indeed, certain Member States specifically express this preference during Board Meetings and when selecting projects to fund. **Figure 8** illustrates this situation. The proportion of disbursements from extrabudgetary funds to non-NPT Member States is much less, fluctuating between 2% and 5%.

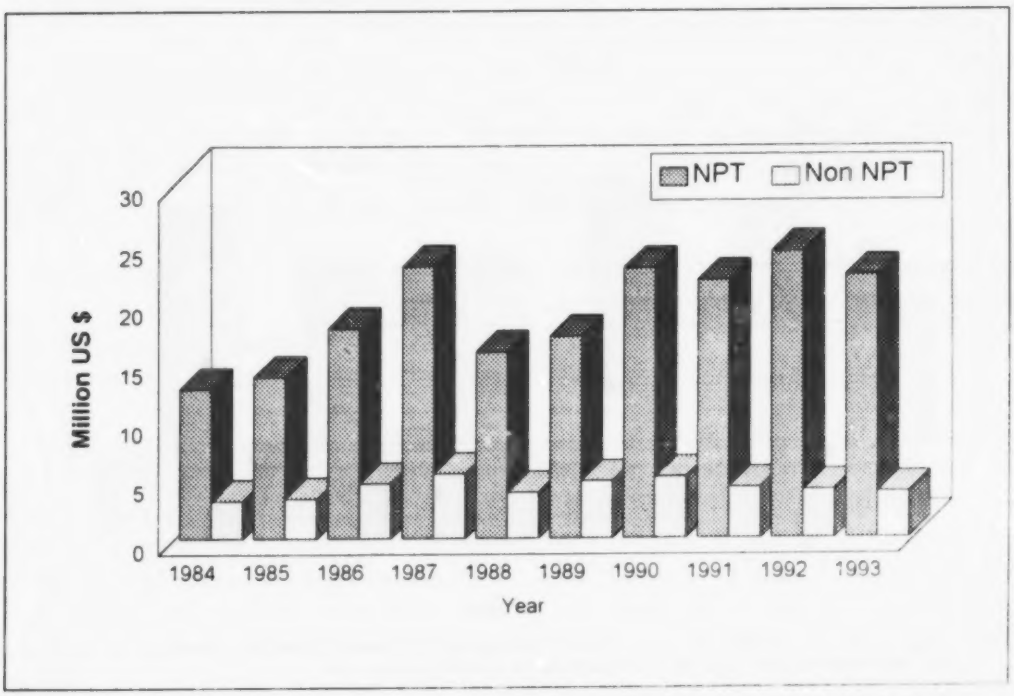

Figure 7 Disbursements from the TACF to Member States party and non-party to NPT.

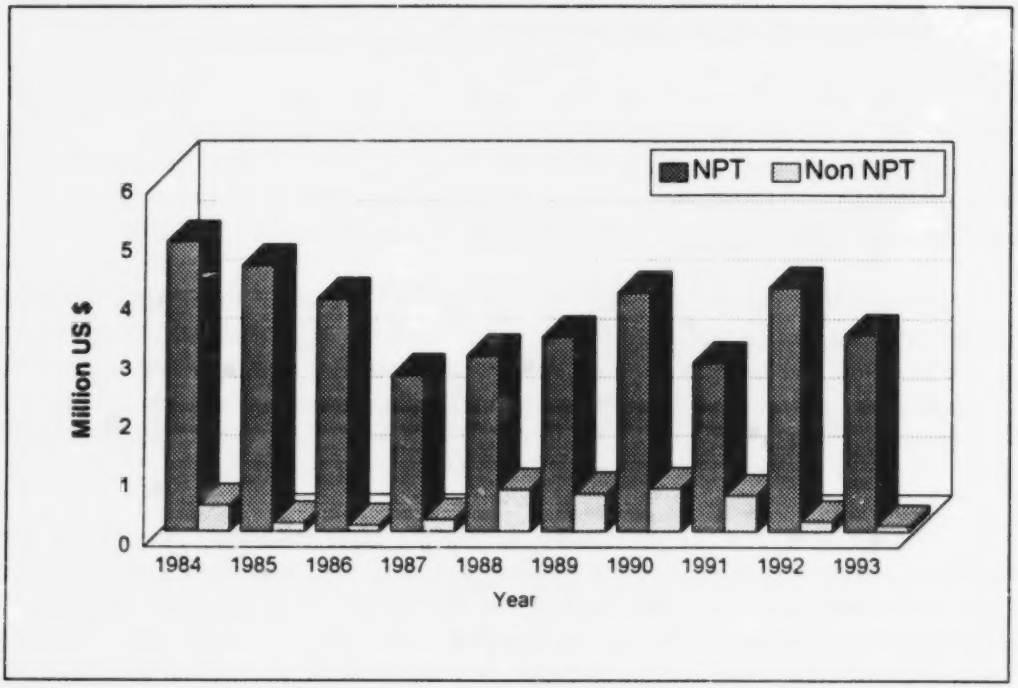

Figure 8 Extrabudgetary disbursements by Member States party and non-party to NPT.

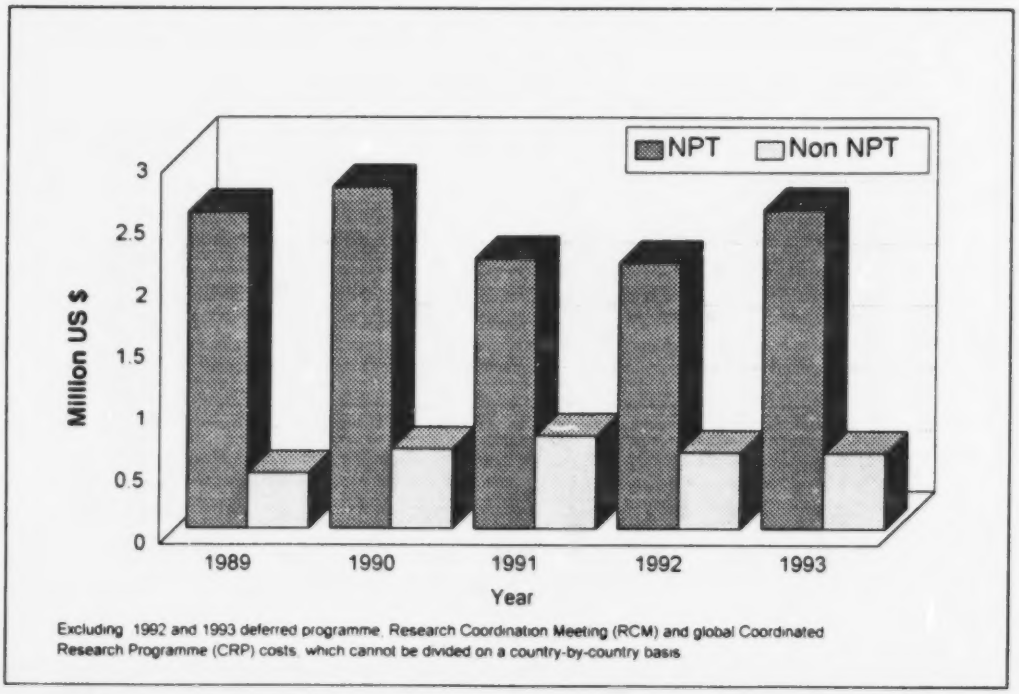

Figure 9 Research contract awards from the Regular Budget to Member States party and non-party to NPT.

Figure 9 shows the distribution by NPT status of Research Contract awards funded by the Regular Programme, for the five-year period 1989 to 1993.

4. TRENDS IN THE TC PROGRAMME

4.1. Diversity of Conditions and Needs

In considering the IAEA's technical co-operation activities, it should be noted that developing Member States differ widely in terms of overall economic development, and, in particular, advancement in nuclear science and technology.

Seventeen of the 32 nations operating or constructing nuclear power plants are developing countries. Some also possess nuclear fuel cycle technology and facilities, including such sophisticated techniques as uranium enrichment, reactor fuel fabrication, spent fuel reprocessing and heavy water production. Some of these countries are already exporting certain nuclear technologies and materials and are providing bilateral assistance to other States in research, development and applications of nuclear technologies. About five additional developing countries are planning to embark on nuclear power programmes in the near future.

Thirty-eight developing Member States operate 85 research reactors of various types and capacities. Nuclear scientific and technological infrastructures have been formed around the reactors, enabling these countries to conduct basic and applied research and development, radioisotope and radiopharmaceutical production, and other research reactor-related activities.

Most developing Member States have gained experience in the application of isotopes and radiation in many fields, including agriculture, medicine, industry and hydrology, and may be relatively advanced in some of them. At the same time there are Member States, particularly among LDCs, where nuclear activities consist mainly in the introduction of limited nuclear techniques and related training.

Thus, the widely differing technical assistance needs and priorities of individual Member States and of different groups of Member States make the Agency's technical co-operation activities highly diverse and prevent concentration on a limited number of applications and techniques.

One particular trend that has emerged in the last years is end-user orientation. Whereas previously, techniques were mostly transferred to specialist groups working at research establishments of national atomic energy commissions, training in and equipment for specific technologies are now increasingly delivered to the sectors concerned. For example, the end-users of medical diagnostic techniques are the hospital staff; the end-users of food irradiation technology are farmers' co-operatives and the food industry; the end users of isotopes in hydrology are the water management institutions.

4.2. Increased Intercountry Co-operation

Three major forms of intercountry technical co-operation activities are used by the Agency: regional co-operative agreements, with the principal aim of promoting and co-ordinating co-operative research, development and training projects in a wide range of nuclear applications and techniques; regional projects each of which deals with one specific nuclear technique or nuclear energy related activity; and interregional projects, normally addressing problems common to Member States in several geographical regions. The regional technical co-operation activities that started to be actively incorporated into the Agency's TC Programme in the late 1970s are an effective mechanism that permits problems common to several countries in one region to be addressed with an intensity of support that could not be provided to each country individually. Of no less importance is the fact that it promotes and facilitates Technical Co-operation among Developing Countries (TCDC).

At present there are three regional co-operative agreements: **AFRA** (Africa Regional Co-operative Agreement for Research, Development and Training); **ARCAL** (Regional Co-operative Agreement for the Development of Nuclear Science and Technology in Latin America); and **RCA** (Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology) for Asia and the Pacific Region. Regional membership has grown steadily and today 49 IAEA Member States are participating in these agreements.

These regional co-operative agreements are concluded under the auspices of the IAEA, which also acts as secretariat and co-ordinator in the formulation and establishment of projects. In fact, the Agency covers three main roles and fulfills three main functions: co-ordination, administration and scientific and technical support.

More than 30 multi-year regional projects are in operation, and about 40 regional training activities are carried out annually in addition to the activities within the regional co-operative agreements. The subjects of these projects and training courses reflect the priorities of the different regions.

The contribution of developing Member States to regional technical co-operation activities is increasing. These countries host the training events and in the case of Asia and Latin America provide most of the experts for the implementation of these agreements.

The expansion of the applications of nuclear techniques in developing Member States is expected to lead to an increasing trend towards regional co-operation and TCDC activities.

4.3. Increased Attention to Radiation Protection, Nuclear Safety and Radioactive Waste Management

Under its Statute, the Agency is authorized to establish or adopt standards of safety for the protection of health, life and property and to provide for their application to assisted operations. The Agency may also, if so requested, provide for the application of such standards to operations under bilateral or multilateral arrangements or to a State's own activities in the field of atomic energy. To enable the Agency to carry out these functions, the Statute provides that it shall have certain rights and responsibilities with respect to any assistance given.

To implement these statutory provisions, The Agency's Safety Standards and Measures contained in document INFCIRC/18 Rev.1 have been approved by the Board of Governors and is mandatory for the Agency's own operations and for Agency-assisted operations. In order to be able to apply the Standards effectively, each country must have in place a radiation safety infrastructure that includes:

- A legal framework for licensing or otherwise controlling practices involving exposure to radiation and radioactive substances;
- Provision of inspection and other compliance control activities;
- Technical capabilities to provide services such as radiation monitoring and emergency response;
- Qualified personnel to assess radiation protection programmes.

Over the years, the Agency has been assisting its developing Member States in establishing and strengthening their radiation safety (including waste management) infrastructures. A range of ways and means has been developed and is being used for this purpose, including technical meetings, provision of a large body of safety standards and guides, advisory missions, individual and group training, expert services and equipment. Most of these have been provided through the TC Programme: safety related activities — consisting of projects in the fields of radioactive waste management, radiation protection and the safety of nuclear installations — accounted for 20% of all TC disbursements in 1993, a share that has been slowly but steadily increasing from year to year.

In spite of these efforts, the radiation safety situation in many developing Member States still needs to be improved. A few countries have not yet established the appropriate infrastructure. In several other countries, although a minimum infrastructure is formally in place, the actual level of radiation safety is inadequate, mainly resulting from a lack of national support for such activities. **Radiation safety control mechanisms are deemed inadequate in more than half of the IAEA's developing Member States.** This situation, as monitored by the Agency, is shown in **Table 1**.

TABLE 1

Percentage of the IAEA Developing Member States
lacking some components of Radiation Protection Infrastructure

COMPONENTS MISSING	% FOR YEARS WHEN MONITORED		
	1984	1987	1993
General radiation protection law	28	22	16
Regulation/codes of practice	87	85	19
Licensing and inspection	74	70	43
Personnel monitoring	41	32	17
Emergency preparedness plans	86	78	43
Food contamination control	(-)*	88	21

*Not monitored in 1984

The continuing rapid growth in most developing countries in the application of nuclear techniques in agriculture, medicine, hydrology, industry, environmental surveillance and research makes the problem of radiation safety and waste management increasingly acute, requiring further enhancement of the Agency's co-operation and assistance in this direction. Therefore, in addition to large numbers of ongoing TC projects dealing with radiation safety, two interregional model projects were approved by the Board of Governors in 1993 that aim to support upgrading national infrastructures in radiation protection and waste management in a number of Member States to appropriate levels and standards as established by the Agency.

5. STRENGTHENING TRANSFER OF TECHNOLOGY

As Member States party to NPT represent the majority of IAEA membership, it is natural that their interests and requirements are specifically reflected in the Agency's medium term plans and biennial programmes. In preparing these plans and programmes, present situation and expected developments in the peaceful uses of atomic energy are assessed.

The growing world population will need more energy, particularly electricity, in the years ahead. The medium term period, therefore, will require much analysis of energy options at the national, regional and global levels, and important energy policy decisions are likely to be made. As there is no global intergovernmental energy organization, the IAEA will stimulate and, where necessary, co-ordinate the international efforts required to assess the benefits and problems of various power options including nuclear energy.

When considering the Agency's role in contributing to the transfer of nuclear power and fuel cycle technology, it should be recognized that the nuclear industry has made great progress in commercializing many technologies and that new suppliers have appeared on the market, some of them in developing countries. The IAEA's future role should be to find more ways of supporting and assisting buyers and to remove obstacles to free choice. The Agency's traditional function of providing a forum for information exchange in this area may expand in the future if demand for nuclear power increases and if this increase is followed by expanded development programmes in the field of power reactor technology and design. The Agency should also be ready to respond to requests for assistance from developing countries that are considering the nuclear option, particularly in the area of manpower training.

The increasing world population, with a major part living in developing areas, will also need greatly increased supplies of food and fresh water, better health care and greater access to industrial goods. Nuclear methods that can lead to improvements in the production and preservation of food, in health care, in industrial production and in the provision of water supplies are increasing in number. They are often competitive with other methods - and indeed in some cases they are the only methods available. The scope for the exchange of experience in using nuclear methods and for trasnferring these methods to developing countries is therefore expanding. Non-power applications of nuclear energy will remain the area of technology transfer of greatest interest for a large number of Member States.

The Agency's task in the medium term will almost invariably be to create or strengthen capabilities at the national level, primarily through the TC Programme. Achieving this goal will require greater precision in identifying those areas where assistance will have the most impact.

A high priority among the Agency's activities in the medium term will be given to nuclear safety, radiation protection and waste management for further expansion of the application of nuclear techniques in the various sectors of national economies.

On the basis of the above assessments and forecasts, three overall objectives were formulated for the Agency's medium term activities. The following two of these objectives fall predominantly into the context of discussions at the 1990 NPTRC on Article IV of the Treaty.

5.1. Enhancing Technical Co-operation

The objective is to enhance the transfer of nuclear technology and know-how to developing countries, specifically:

(a) To ensure, through increased interaction with the responsible governmental authorities, that the Agency's technology transfer activities are **in line with national development plans.** The aim of Agency assistance will be to strengthen the relevant national infrastructures so that they become self-supporting. Manpower development, quality control services and maintenance of nuclear instrumentation will receive more attention under this strategy. In view of the important role of the TC Programme in achieving these objectives, the traditional means and procedures for technology transfer are being reviewed to ensure delivery of a high quality programme.

(b) To help establish and strengthen national nuclear safety, radiation protection and waste management systems as a prerequisite for the development of nuclear energy programmes, mainly through the provision of training and advice.

(c) To give priority, when selecting areas for co-operation, to provision of assistance in the transfer of technology to areas involving basic human needs, such as food and water resources, health, and energy supply, and to the transfer of techniques contributing to environmental protection and **sustainable development**.

(d) To promote only those nuclear techniques in developing countries which have a clear advantage over other techniques, to this end, comparing nuclear and non-nuclear techniques, taking into account the conditions prevailing in the recipient countries.

(e) To co-operate with the relevant international organizations in establishing appropriate databases and systematically analysing the economic, health, environmental and climatic impacts of various energy options; in particular to contribute analyses and data concerning nuclear power to such studies and to make the results of this work widely available to experts in Member States.

(f) To promote the exchange of information and international discussions with interested Member States, and such parties as World Association of Nuclear Operators (WANO) and international financial institutions, with the aim of developing new schemes for financing, constructing and operating nuclear power plants in developing countries.

(g) To perform global analyses and strategic studies of selected aspects of nuclear power and the fuel cycle, including assurance of supply.

5.2. Achieving and Maintaining a High Level of Nuclear Safety

The objective is to provide international leadership and assistance in achieving and maintaining a high level of nuclear safety worldwide and minimizing the environmental impact of all types of peaceful nuclear facilities and applications, specifically:

(a) To provide international leadership and assistance to national nuclear safety authorities, especially to governmental nuclear regulatory bodies, with a view to detecting and correcting safety deficiencies in operating nuclear facilities and the prevention of accidents. To this end:

- To develop and implement a more thorough and transparent system to overview the safety of all operating nuclear installations;
- To develop a common basis for judging the acceptable level of safety of all operating nuclear power plants built to past safety standards, with direct assistance provided to Member States in performing periodical reviews of such plants and in assessing and monitoring the effects of ageing on safety.

(b) To co-ordinate the efforts of international and national bodies in reaching a consensus on safety principles for the design of future nuclear power plants.

(c) To take the lead in developing an international technical consensus on the acceptability of methods for the management and disposal of nuclear waste of all kinds, and to help gain public confidence in these matters.

(d) To provide expanded international guidance and assistance to national nuclear safety authorities to ensure the safety of research reactors, spent fuel management facilities and installations using radiation sources, with special attention to the larger research reactors and irradiation facilities.

(e) To establish a harmonized international approach to all aspects of nuclear safety, including the incorporation of the recommendations of the International Commission on Radiological Protection (ICRP) into the Agency's standards and guides.

6. CHALLENGES TO TECHNICAL CO-OPERATION

With the increase in diversity and complexity of nuclear techniques and technology, and with the rapid growth of the needs of developing countries for more sophisticated tools to solve difficult problems, their societies and economies face, technical co-operation programme of the Agency has to deal with several new challenges of diverse nature.

6.1. The Environment and Sustainable Development

A number of problems identified by the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 and summarized as "**Agenda 21**" under the broad concept of "sustainable development" fall within the Agency's mandate. These are being or are about to be addressed through the TC and Regular Programmes. Nuclear techniques are directly relevant to many of the items in "Agenda 21".

Many of the Agency's technical co-operation activities have direct relation to **sustainable development**, for example, projects in the areas of food and agriculture, animal husbandry, water resource management, and the promotion of human health.

Of particular interest are the Agency's efforts to promote the use of techniques that minimize or even eliminate the environmental impact of certain human activities. For example, industrial radiation sterilization of a broad range of medical products has replaced earlier processes that used highly toxic gases which were released to the atmosphere. Electron-beam processing technology applied to flue gases of fossil fuel-burning plants to reduce toxic emissions of SO_2 and NO_x into the atmosphere.

"Agenda 21" calls upon individual countries to create policies that minimize the generation of radioactive wastes and promote their safe storage, transport and disposal. The Agency takes the leading international role in the area of radiation protection and safety, including management of radioactive wastes.

6.2. New Member States and their Needs

Following the political and economic changes that took place lately in Central and Eastern Europe, several newly independent States have joined the Agency and others are taking the necessary steps to that effect. Many of these countries face major problems arising from previous programmes in nuclear power utilization, weapons development and nuclear techniques applications. Technical assistance is needed to replace defunct infrastructures, establish regulatory bodies, train manpower, and support implementation of remedial measures to upgrade nuclear facilities to modern operational and safety standards, while bringing environmental problems under control. As a basis for these activities, the countries concerned need to establish internationally proven regulatory practices relating to the licensing, control and inspection of their nuclear facilities. They also need to prepare for decommissioning of a number of these facilities in the near future.

It must be recognized that certain radiation protection and safety issues in Central and Eastern European and former Soviet Union States deriving from past and existing nuclear activities, pose considerable problems. These will need to be tackled in ways that, in many cases, have yet to be determined.

Several initiatives have been undertaken by international organizations to address these problems, but more needs to be accomplished. A joint UNDP-IAEA forum was held in Vienna in 1993 to foster information exchange and to seek technical support and funding. Ministers and senior officials of the affected countries attended. As a follow up to this forum, detailed and thorough fact finding missions have been fielded to several former Soviet Union States to gather technical information and evaluate requirements, including manpower development needs. Apart from raising awareness of the needs and problems, it is highly desirable that the resources are forthcoming. So far however these funds for remedial actions have not been secured. It is believed that the Agency's experience in seeking and gaining international support for such activities will play a major role in solving the problems that are being identified — a role that will continue in some cases for at least a decade. In view of the urgency to start action, the Agency will begin under the 1995-1996 TC programme a $2.7 million regional project to assist the implementation of safety improvements in Russian designed nuclear power plants.

6.3. Impact of Technical Co-operation

A major challenge for the Agency and the Member States involved in the TC Programme is to maximize the **impact** of the individual projects at the country level. The impact can be reasonably assessed only in terms of the change achieved in some measurable factor, for example greater availability of electrical energy, better product quality using non-destructive testing techniques, or better public health because of improvements in and increased use of nuclear techniques for diagnosis and treatment.

All these factors depend on the continued use of the technology or techniques by the country after the Agency input has been delivered. Sustainability is created at the national level through for example the absorptive capacity for a technique, a stable manpower situation and continued financial support. However, the prime factor is the perception at government level of the importance of the technology or technique in terms of national development priorities and goals.

A start has been made by sending **Country Programme Review Missions** in response to requests by Member States to help define the national programme of technical co-operation with the Agency. These missions help the government select meaningful technical co-operation inputs in line with national development plans and priorities, i.e. ensuring project "relevance". It is only by ensuring government awareness of the relative values of nuclear technologies, and of their respective impacts on achieving national goals, that a government commitment can be assured. Such assurance is essential if Agency inputs are not to support activities that, while important to specific groups in the country, are of limited or no importance in the overall national or sectoral plan as seen by the government, and that will therefore cease if

Agency support is withdrawn. In 1993 nine Country Programme Review Missions were undertaken, and in the first six months of 1994 a further three were fielded. When a request is received for assistance in the design of a specific project, the Agency is prepared to mount **Pre-Project Missions**. Both mechanisms appear to be effective in assisting Member States to maximize the relevance, feasibility and hence the benefits, of the proposed project with the Agency. The more obvious the benefits of a given project and its associated technology, the greater will be the government's interest in continuing the activity.

6.4. Advanced Technologies and Techniques

For over three decades, the IAEA's technical co-operation activities have been geared to establishing and strengthening national infrastructures, in order to enable developing Member States to use nuclear techniques in various areas of research and applications. With the Agency's assistance, many recipient countries made big progress in this respect by the early 1990s. Nuclear research laboratories or groups had been established in many research institutions and scientific centres; large numbers of local scientists and specialists had obtained nuclear related knowledge and skills through a wide range of training opportunities (fellowships, training courses, expert services); and nuclear regulatory and administrative systems had been established in most developing Member States.

However, as countries achieve higher levels of development, with growing proportions of their societies enjoying the benefits, their needs will increase in all areas, including science and technology. Indeed, many developing Member States that have enjoyed technical co-operation with the Agency for several years have reached high levels of sophistication in the application of nuclear techniques. Therefore, **new projects** for continuing the development of national economies **have become more advanced, more complex, and larger** in terms of both implementation and funding.

For example, requests are increasing for assistance in establishing radioisotope production facilities (research reactors or cyclotrons), or in support of power reactor maintenance and safety activities (probabilistic safety analysis training) and environmental monitoring and remediation programmes (nuclear analytical techniques, radioactive tracer techniques, removal of SO_2 and NO_x from flue gases emission....).

Implementation of such large and complex projects requires not only a serious, long term commitment from both Agency and recipient country, but also, in many cases, **complementary bilateral co-operation** to achieve the objectives.

6.5. Public Acceptance of Nuclear Technology

In view of public sensitivity about the acceptance of nuclear power and application of nuclear techniques in such areas as agriculture, food preservation and health, the Agency will need to continue wider dissemination of relevant information on the various aspects of nuclear applications. The acceptance is based on the public's perception of "risk" and "necessity". For example, medical diagnostics or treatment of

cancer using nuclear techniques and radiation are rarely objected to while nuclear power or the irradiation of foodstuffs to improve food safety are frequently rejected.

The issue of public acceptance, however, must be primarily addressed at the national level with due participation of the atomic energy commissions as well as concerned government departments and the media. It remains for the Member States to determine whether and to what extent the IAEA should contribute to a well-informed public debate on nuclear technology and applications.

7. MEETING THE CHALLENGES

The IAEA is recognized by most governments as an **independent source of advice and assistance**, serving as a clearing house for information on all aspects of nuclear technology, including regulatory and radiation protection and safety issues. Furthermore, it is accepted as an "honest broker" between Member States wishing to collaborate either through Agency mechanisms or bilaterally with Agency support.

The application of nuclear techniques in areas involving basic human needs, radiation protection, nuclear safety, radioactive waste management, environmental protection and sustainable development, are major issues drawing particular attention from the Agency and its Member States.

To meet the many and diverse challenges, two courses of action are deemed necessary. The first is to review and redirect technical co-operation to ensure that **technology transfer** is achieved. The second is to ensure that the necessary financial resources are available at the level required to respond to the genuine needs of Member States once priorities have been carefully set and agreed by the Agency and the States concerned.

7.1. Redirection of Technical Co-operation Activities

Agency assistance has been effective in establishing and strengthening national infrastructures to enable Member States to exploit nuclear techniques. Each country builds on this foundation its future programme of peaceful applications of atomic energy. The prime responsibility for utilizing the infrastructure lies with the individual Member States.

Indeed, proven government commitment, a valid project objective and a clear benefit to an identified end-user are the primary considerations when projects are being appraised for inclusion in the TC Programme.

In view of these factors, the Agency is seeking to ensure that its technical co-operation projects are **in line with the Member States' national development plans,** are of a **practical** nature, are oriented towards the **end-user**, and are intended to have a significant **impact** on the development of the countries concerned. Special emphasis

is being placed on projects which combine all of the above features. They are identified as **model projects** and are intended to serve as beacons for the direction in which the TC Programme is gradually moving.

Intensive discussions concerning a gradual redirection of technical co-operation activities have stimulated efforts within the Agency towards more rational planning and implementation of individual projects and programmes. A concept of integrated handling of all forms of technical co-operation (national, regional, interregional) in one area of nuclear application (e.g. nuclear techniques in food production) or nuclear-related activity (e.g. radiation protection) has been proposed. For projects of similar scientific content and of recurrent nature the establishment of standard technical assistance **packages** which might include experts, training courses, fellowships and equipment are being considered.

7.2. Meeting The Needs of Member States

What does this changing pattern mean in terms of funding the Agency's technical co-operation activities? Surprisingly, the additional resources required are remarkably small in relation to the importance and magnitude of the tasks ahead.

The historical evolution of the funding of the TC Programme since the establishment of NPT can be seen by referring back to **Figure 5** and **Figure 6**. In the last five years the delivery has fluctuated around a rather constant value, some $40 million per year, reflecting the various influences from both donors and recipient Member States.

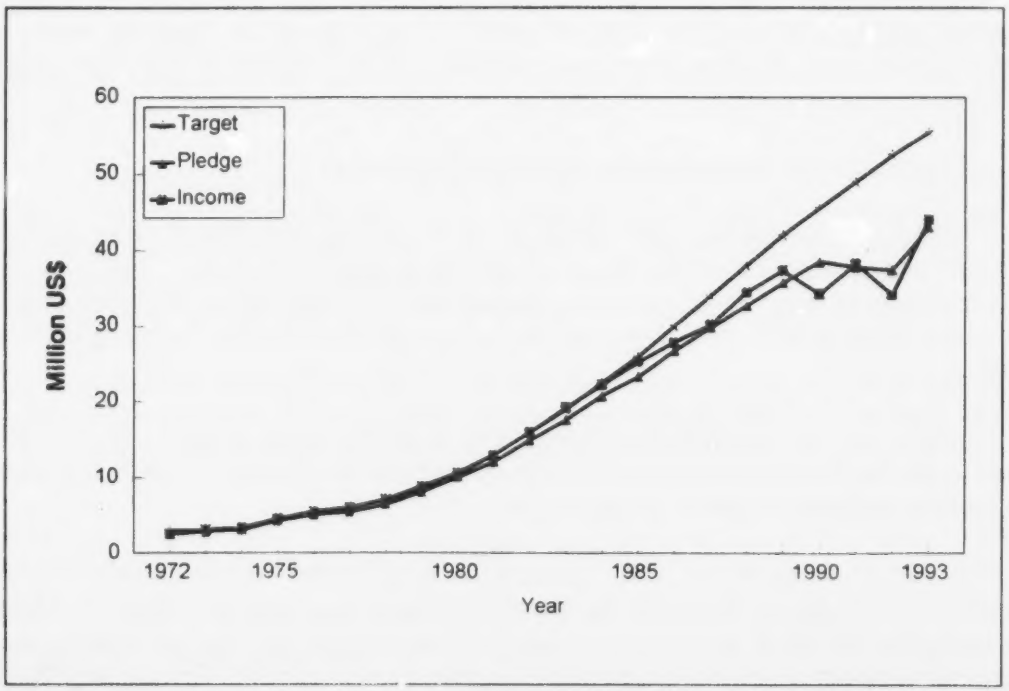

Figure 10 Pledges and income compared with target contributions to the TACF by year

Figure 10 shows the situation in respect of pledges and payments towards the TACF target set for the TC Programme from 1972 to 1993. As has been described in Section 3.3, the target contribution to the TACF results from prior consultations. Member States are then encouraged to pledge in full their respective targets. The actual payments made to the TACF may differ from the pledge, which may in turn differ from the target. For the first decade (1973-82) the percentage of the target pledged was above 90% and almost all pledges materialized. However, from 1983 onwards many Member States stopped or decreased their pledge *vis-à-vis* their calculated share. The result was a dramatic decrease in the income as percentage of the target which reached the bottom level of 60% in 1992.

The next effect was that the benefits of an increasing target were completely annihilated by the decrease in payments, hence the decrease of benefits to developing Member States. The shares, pledges and payments received in 1993 are shown in the **Annex**.

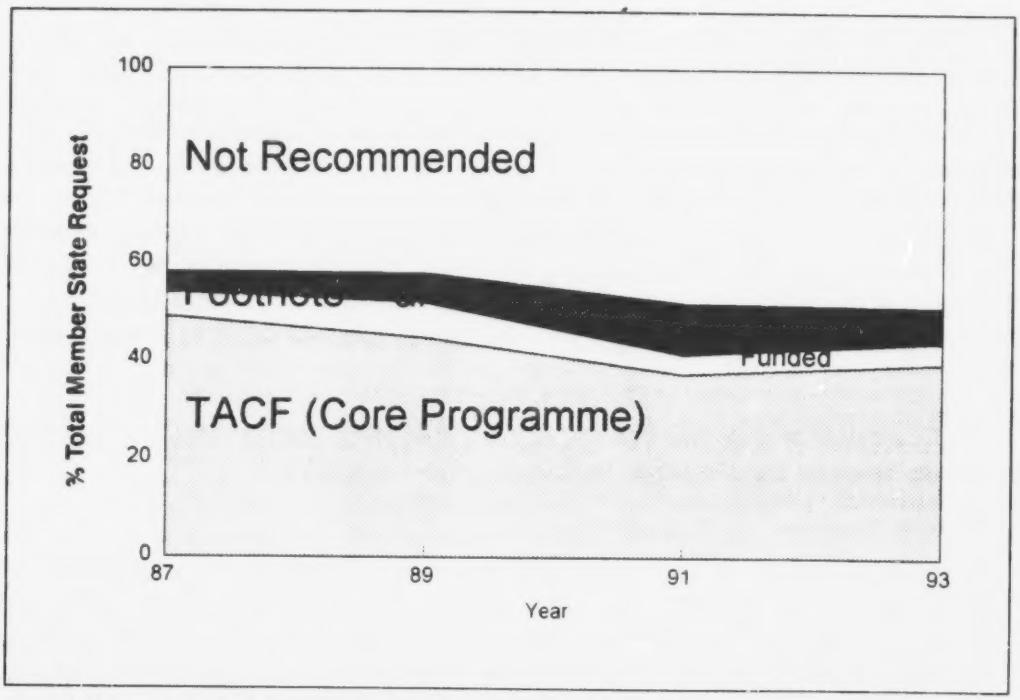

Figure 11 The TC Programme by year divided into a core component, and financed and unfinanced Footnote a/ components, shown as a proportion of the total request for technical assistance by Member State Governments.

Figure 11 shows the value of the total requests for technical assistance by Member States, (represented by the 100% line) for the period 1987 to 1993. These requests undergo appraisal by the Agency and a TC programme is proposed by the Secretariat to the Board for approval (shaded area). It should be noted that the approved programme represents only about 50% of the initial demands coming from developing Member States. The portion indicated as "Core Programme" represents the percentage of the programme in a given year, funded by the TACF. The Footnote a/ portion corresponds to the additional resources (extrabudgetary) necessary to cover the approved programme.

From this figure it can be concluded that, during the period considered, between 6% and 20% of the approved TC Programme remained "unfunded" and could not therefore be implemented. If projected to the next programme cycle (1995-96) it means that about $13.5 million per year of additional contribution would be required for the implementation of the entire approved programme. A concomitant supplement to the Agency's Regular Budget would be needed to manage the expanded activities.

8. CONCLUSION

From the present overview it can be seen that the IAEA undertakes a multitude of activities which are in line with Article IV of the NPT, and has substantially contributed to the promotion of nuclear energy and its applications in developing Member States. In fact, for most of these countries, Agency-supported projects provided key inputs to the establishment of national infrastructures required for the introduction of nuclear techniques in such areas of basic human needs as food production and supply, public health, industry and environment, as well as energy generation and related safety issues.

The overview also shows that the Agency's existing mechanisms and practices for nuclear technology transfer have the following main strengths:

- Transfer of technology and techniques has always ranked highly among the main objectives of the Agency which also include the establishment of health and safety standards, the development and implementation of safeguards and extend to such matters, as, for example, the establishment of guidelines and an international convention relating to the physical protection of nuclear materials. As a result, there has been a steady growth of resources and an extensive involvement of the Agency's overall efforts in technology transfer activities, both under the TC Programme and the Regular Programme. Indeed the growth in resources for the TC Programme has been proportionally much greater than for activities relating to the Agency's other main objectives which are financed from the Regular Budget, to which the principle of zero real growth continues to apply.

- The Agency has a well-established mechanism for considering policy matters and operational issues related to technical co-operation. This includes regular sessions of the Policy Making Organs, the Technical Assistance and Co-operation Committee (TACC), periodic TC Policy Review Seminars, *ad-hoc* advisory groups of external consultants, systematic internal evaluation of project performance etc, which enable necessary in-depth reviews to be undertaken. By these means, the Agency is able to identify, generally in good time, the modifications and technical adjustments necessary to maintain the efficiency and quality of its assistance.

- Technical co-operation plays an important role in tune with the process of development of recipient nations.

This overview also shows that there is plenty of scope for improvement of technology transfer, using both bilateral and multilateral channels, and hence contributing to bridging the technological gap between developed and developing countries.

In view of its structure, experience in technical co-operation and mechanisms of control, the IAEA provides a unique opportunity to all countries for the furtherance of the utilization of nuclear energy for peaceful purposes as envisaged by Article IV of the NPT.

GLOSSARY

Adjusted programme - the total value of all technical co-operation activities approved for a given calendar year plus all approved assistance brought forward from previous years but not yet implemented.

Disbursements - actual cash outlays for goods provided and services rendered.

Earmarkings - amounts allotted for funding approved assistance awaiting implementation.

Extrabudgetary funds - funds provided by Member States for financing specific projects or activities. These funds are separate from voluntary contributions to the Technical Assistance and Co-operation Fund.

Footnote a/ projects - projects approved by the Board for which no immediate funds are available.

Funds in trust - funds received from Member States to finance assistance for themselves.

Implementation - the volume of funds obligated (new obligations) in a given period.

Implementation rate - a ratio obtained by dividing implementation by the adjusted programme (expressed as a percentage).

Technical Assistance and Co-operation Fund - at present, the main fund for the financing of the Agency's technical co-operation activities; it is supported by voluntary contributions from Member States.

UNDP Programme - projects executed by the Agency on behalf of UNDP and its associated funds, including UNFSTD.

ANNEX

VOLUNTARY CONTRIBUTIONS TO THE TECHNICAL ASSISTANCE AND CO-OPERATION FUND FOR 1993

AS AT 30 JUNE 1994

	1993				Over payments
	Target	Pledged	Paid	Outstanding	
Afghanistan	5,550	0	0	0	
Albania	5,550	0	0	0	
Algeria	88,800	45,000	45,000	0	
Argentina	310,800	270,000	270,000	0	
Australia	832,500	831,979	831,979	0	
Austria	410,700	410,700	410,700	0	
Bangladesh	5,550	5,550	5,550	0	
Belarus	172,050	0	0	0	
Belgium	582,750	0	0	0	
Bolivia	5,550	0	0	0	
Brazil	876,900	250,000	0	250,000	
Bulgaria	72,150	10,000	10,000	0	
Cambodia	5,550	0	0	0	
Cameroon	5,550	0	0	0	
Canada	1,714,950	3,081,261	3,081,261	0	
Chile	44,400	44,400	44,400	0	
China	421,800	421,800	421,800	0	
Colombia	72,150	55,000	55,000	0	
Costa Rica	5,550	0	0	0	
Cote d'Ivoire	11,100	0	0	0	
Cuba	49,950	49,950	49,950	0	
Cyprus	11,100	0	0	0	
Democratic People's Republic of Korea	27,750	27,750	27,365	385	
Denmark	355,200	355,200	355,200	0	
Dominican Republic	11,100	0	0	0	
Ecuador	16,650	0	0	0	
Egypt	38,850	38,851	38,851	0	
El Salvador	5,550	0	0	0	
Ethiopia	5,550	0	0	0	
Finland	310,800	310,800	310,800	0	
France	3,302,250	3,302,250	3,302,250	0	
Gabon	11,100	0	0	0	
Germany	4,917,300	4,917,300	4,917,300	0	
Ghana	5,550	0	0	0	
Greece	194,250	194,250	194,250	0	
Guatemala	11,100	11,100	0	11,100	
Haiti	5,550	0	0	0	
Holy See	5,550	0	0	0	
Hungary	99,900	99,900	99,900	0	
Iceland	16,650	16,650	16,650	0	
India	199,800	199,800	199,800	0	
Indonesia	88,800	39,000	39,000	0	
Iran, Islamic Republic of	421,800	16,892	16,892	0	
Iraq	72,150	0	0	0	
Ireland	99,900	8,311	8,311	0	
Israel	127,650	0	0	0	
Italy	2,364,300	0	0	0	
Jamaica	5,550	0	0	0	
Japan	6,859,800	6,859,800	6,859,800	0	
Jordan	5,550	0	0	0	
Kenya	5,550	0	0	0	
Korea, Republic of	377,400	244,755	244,755	0	
Kuwait	138,750	0	0	0	
Lebanon	5,550	0	0	0	
Liberia	5,550	0	0	0	
Libyan Arab Jamahiriya	133,200	0	0	0	
Liechtenstein	5,550	5,600	5,600	0	
Luxembourg	33,300	0	0	0	
Madagascar	5,550	1,600	0	1,600	
Malaysia	66,600	66,600	66,600	0	
Mali	5,550	0	0	0	
Mauritius	5,550	0	0	0	
Mexico	482,850	482,850	482,850	0	
Monaco	5,550	0	0	0	
Mongolia	5,550	0	0	0	
Morocco	16,650	16,650	16,650	0	
Myanmar	5,550	0	0	0	
Namibia	5,550	0	0	0	
Netherlands	826,950	826,950	826,950	0	
New Zealand	133,200	0	0	0	

VOLUNTARY CONTRIBUTIONS TO THE TECHNICAL ASSISTANCE AND CO-OPERATION FUND FOR 1993

AS AT 30 JUNE 1994

	1993					Over payments
	Target	Pledged	Paid	Outstanding		
Nicaragua	5,550	0	0	0		
Niger	5,550	0	0	0		
Nigeria	111,000	111,000	111,000	0		
Norway	305,250	305,250	305,250	0		
Pakistan	33,300	33,300	33,300	0		
Panama	11,100	0	0	0		
Paraguay	11,100	0	0	0		
Peru	33,300	0	0	0		
Philippines	38,850	11,000	11,000	0		
Poland	260,850	260,850	260,850	0		
Portugal	111,000	50,000	50,000	0		
Qatar	27,750	0	0	0		
Romania	94,350	94,350	43,262	51,088		
Russian Federation	5,183,700	60,789	60,789	0		
Saudi Arabia	527,250	0	0	0		
Senegal	5,550	0	0	0		
Sierra Leone	5,550	0	0	0		
Singapore	66,600	0	0	0		
South Africa	227,550	0	0	0		
Spain	1,087,800	168,695	168,695	0		
Sri Lanka	5,550	0	0	0		
Sudan	5,550	0	0	0		
Sweden	610,500	610,500	610,500	0		
Switzerland	638,250	638,250	638,250	0		
Syrian Arab Republic	22,200	2,000	2,000	0		
Thailand	61,050	61,050	61,050	0		
Tunisia	16,650	16,650	16,650	0		
Turkey	149,850	149,850	149,850	0		
Uganda	5,550	0	0	0		
Ukraine	649,350	0	0	0		
United Arab Emirates	116,550	0	0	0		
United Kingdom of Great Britain and Northern Ireland	2,763,900	2,714,080	2,714,080	0		
United Republic of Tanzania	5,550	5,500	0	5,500		
United States of America	13,875,000	13,875,000	13,175,000	700,000		
Uruguay	22,200	15,000	0	15,000		
Venezuela	271,950	0	0	0		
Viet Nam	5,550	5,550	5,550	0		
Yugoslavia	233,100	0	0	0		
Zaire	5,550	0	0	0		
Zambia	5,550	5,550	0	5,550		
Zimbabwe	5,550	0	0	0		
Sub-total	**55,194,750**	**42,712,693**	**41,672,470**	**1,040,223**		**0**
New Members:						
Czech Republic a/	233,100	233,100	233,100	0		
Slovak Republic a/	72,150	72,150	72,150	0		
Sub-total	**55,500,000**	**43,017,943**	**41,977,720**	**1,040,223**		**0**
Armenia b/	72,150	0	0	0		
Croatia c/	72,150	0	0	0		
Estonia d/	38,850	0	0	0		
Lithuania e/	83,250	0	0	0		
Slovenia f/	49,950	49,950	49,950	0		
TOTAL	**55,816,350**	**43,067,893**	**42,027,670**	**1,040,223**		**0**

a/ The Czech Republic and the Slovak Republic became Members of the Agency on 27 September 1993.
b/ Armenia became a Member of the Agency on 27 September 1993.
c/ Croatia became a Member of the Agency on 12 February 1993.
d/ Estonia became a Member of the Agency on 31 January 1992.
e/ Lithuania became a Member of the Agency on 18 November 1993.
f/ Slovenia became a Member of the Agency on 21 September 1992.